FUSS & O'NEILL

October 15, 2013

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BUREAU OF MATERIALS MANAGEMENT
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STORAGE TANK & PCB ENFORCEMENT UNIT

Ms. Kimberly N. Tisa
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code: OSRR07-2
Boston, MA 02109-3912

RE: Request for Approval
Application for Clean-Up of PCB Remediation Waste
Wood Group, 523 Halfway House Road
Windsor Locks, Connecticut

Dear Ms. Tisa:

On behalf of Wood Group GTS, Fuss & O'Neill, Inc. is submitting the attached *Application for Clean-Up of Polychlorinated Biphenyl (PCB) Remediation Waste Under 40 CFR 761.61 (a) & (c)* for your review and approval. The application outlines our approach to characterize and remediate PCBs in shallow soil at concentrations up to 15,000 parts per million (ppm) at the above-referenced property. The PCBs are believed to be associated with PCB-containing petroleum products used by a former site owner that occupied the site between 1965 and the mid-1980s. The application addresses recommendations made by staff at the Connecticut Department of Energy and Environmental Protection (DEEP) during a previous meeting regarding the clean-up of the Site.

If you have any questions regarding the attached application, please contact the undersigned.

Sincerely,

Brent J. Henebry, LEP
Associate

John B. Hankins, LEP
Senior Vice President

c: Gary Trombly – Connecticut DEEP
Gus Eghneim – Wood Group GTS

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Connecticut
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Application for Clean-Up of Polychlorinated Biphenyl Remediation Waste Under 40 CFR § 761.61(a) & (c)

Wood Group Power, Inc.

523 Halfway House Road
Windsor Locks, Connecticut

October 2013

146 Hartford Road
Manchester, Connecticut 06040

Project No. 20051184.R71

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1 Introduction

This Application for the Cleanup of Polychlorinated Biphenyl (PCB) Remediation Waste (the Application) has been prepared on behalf of Wood Group Power, Inc. (Wood Group) to address PCB-impacted soil at 523 Halfway House Road in Windsor Locks, Connecticut (the Site). A portion of a United States Geological Survey Map depicting the Site's location is provided as *Figure 1*.

This application is specific to the remediation PCB-impacted soil and supplements a Remedial Action Plan and Remedial Action Plan Amendment previously prepared for the Site in 2006 and 2009 for the remediation of releases of constituents other than PCBs, primarily cobalt and tungsten, which are present at the locations where PCB-impacts have been identified.

The abatement actions described in this application for PCB-impacts to soil will be conducted in accordance with the Toxic Substances Control Act (TSCA), specifically a risk based disposal approval as described in Title 40 of the Code of Federal Regulations (CFR) Section 761.61(c). A risk based disposal approval under 40 CFR 761.61(c) is being requested because Wood Group is proposing an alternative approach to pre-remediation characterization as described in 40 CFR 761.61(a)(2) and clean-up verification sampling as described in 40 CFR 761.61(a)(6). In summary, we believe that the approach we have outlined is appropriate based on the following reasoning:

- *Grid Sampling*: As described in *Section 4.1.7*, we are proposing to collect post-remediation verification sampling using a 3-meter grid sampling interval and composite sampling scheme as described in Subpart N of TSCA. The number of samples collected as part of this clean-up verification process will satisfy the 3-meter grid spacing interval required for pre-characterization sampling. This data, in combination with the more than 75 samples soil samples that have been collected to date and more than 25 additional soil samples proposed for collection prior to implementation of remedial activities as described in *Section 2.3*, will provide a sufficient quantity of sample results to demonstrate that PCB impacted soil that exceeds appropriate regulatory clean-up criteria have been removed from the site.

- *Discrete Post-Excavation Sampling*: In addition, as described in *Section 4.1.7*, discrete soil samples will be collected and analyzed for PCBs and other constituents of concern at a frequency of approximately one sample per 30 feet of excavation side wall and one sample per approximately 600 square feet along the excavation bottom to demonstrate compliance with Connecticut's Remediation Standard Regulations. We estimate that approximately 60 additional discrete samples will be collected following remediation providing additional confirmation that PCB-impacted soil that exceeds appropriate regulatory clean-up criteria has been removed from the site.

- *Site Use*: The site is zoned for industrial/commercial use and an environmental land use restriction will be placed on the site's land records preventing the use of the site for residential purposes. Based on the industrial/commercial nature of the site, the potential for exposure is limited when compared to residential usage.

2 Background & Site Characterization

2.1 Background

In March of 2006, a Remedial Action Plan was prepared to address releases of heavy metals, primarily cobalt and tungsten, and petroleum hydrocarbons to soil. Prior to finalization of the Remedial Action Plan, clean-up criteria for tungsten and cobalt needed to be derived and approved by the Connecticut Department of Energy and Environmental Protection (DEEP)[1] since remediation criteria had not previously been established for these metals. The DEEP derived clean-up criteria for these metals in early-2009, and an Addendum to the Remedial Action Plan was prepared in May of 2009 that addressed the DEEP-derived clean-up criteria. In July 2009, mobilization for the remediation project was initiated and polychlorinated biphenyls (PCBs) were discovered in soil during routine in situ waste characterization sampling prior to full-scale soil remediation. The soil remediation project was suspended, and Fuss & O'Neill conducted investigations to evaluate the extent and magnitude of the release of PCBs to soil and groundwater in the fall of 2009.

2.2 Site Characterization Summary

A conceptual model that presents historical information and PCB release characterization data is included as *Appendix A*. To aid the review of this application and provide necessary background information, we have provided the following information required for the review of a self-implementing clean-up as described in 40 CFR Section 761.61(a)(3):

> *(A) the nature of the contamination including the kinds of materials contaminated*
>
> *(B) a summary of the procedures used to sample contaminated and adjacent areas, a table, and clean-up map showing PCB concentrations measured in all pre-clean up characterization samples*
>
> *(C) the location and extent of the identified contaminated area*

The conceptual model provided in *Appendix A* includes this information. In summary, the results of our investigation indicate that PCBs are present in shallow soil (generally less than four feet below grade) in two areas (shown on *Figure 2*):

- An upper release area located beneath and adjacent to the existing building that encompasses approximately 13,200 square feet
- A lower release area located in a dry drainage swale on the eastern portion of the site that encompasses approximately 5,500 square feet

[1] In portions of this report we refer to the Connecticut Department of Energy and Environmental Protection (DEEP). The Connecticut Department of Environmental Protection (CTDEP) was re-named the Department of Energy and Environmental Protection (DEEP) in July 2011. For convenience and consistency, we refer to the agency as the DEEP throughout this report, including the timeframe prior to July 2011.

PCB Source

Based on a review of historical site operations and the correlation between the PCB release areas with releases of cobalt and tungsten, we conclude the PCB releases are associated with the historical manufacture of tungsten-carbide tools by Kennametal (a former site occupant). We suspect that the PCBs were likely present in vacuum pump oils, lubricating oils, cutting oils, or possibly hydraulic oils and dedusting agents, all of which could have contained PCBs. The PCBs are suspected to have been released to the ground surface south of the original site building prior to Kennametal's departure from the site in the mid-1980s. PCBs most likely entered the swale via a sub-surface pipe that connected to either a catch basin at the southwest corner of the original building, drains inside the building, or both.

Distribution of PCBs

The highest concentration of PCBs reported in the upper release area is 15,000 milligrams per kilogram (mg/kg), detected in the 0- to 1-foot depth interval below asphalt pavement at WC-09 and P1-105 on *Figure 2*. In the lower release area, the highest concentration of PCBs was 56 mg/kg, reported in the 0- to 2-foot depth interval at P3-101/P3-101A, adjacent to the outfall of the sub-surface drainage pipe. The highest concentrations of PCBs correlate with releases of tungsten and cobalt, which are used in the manufacture of tungsten-carbide tools. Petroleum compounds have also been identified where the highest PCB concentrations were detected, suggesting an oil-based source.

Groundwater Evaluation

Groundwater analytical results for PCBs indicate that releases to groundwater have not occurred as PCBs were not detected in groundwater samples collected at and downgradient of the identified release areas. As requested by the USEPA, Dr. Kevin Miller of Fuss & O'Neill reviewed the chromatograms for the PCB groundwater analyses and agrees with the non-detect results reported by the laboratory. No extraneous peaks were noted on the chromatograms. The laboratory followed Connecticut's Reasonable Confidence Protocols (RCPs) for the PCB analyses and reporting. The RCP checklists included with the laboratory reports indicated that reasonable confidence was achieved for the PCB analyses. Laboratory quality assurance /quality control (QA/QC) sample results were within acceptable ranges. The chromatograms are included as *Appendix B*.

2.3 Supplemental Characterization

The soil sampling described in the conceptual model in *Appendix A* focused on identifying the likely extent of impacted soil. This was the most efficient means of rapidly gaining an understanding of the magnitude and extent of the release area.

The conceptual model presented in *Appendix A* was provided to the DEEP for review and was discussed further in a meeting with DEEP technical staff, including Mr. Gary Trombly, Jr. and Ms. Lori Saliby of the DEEP PCB Program and Ms. Michelle Bedson of the Remediation

Program, on December 3, 2009. At this meeting, representatives of Wood Group and Fuss & O'Neill presented the conceptual model for the PCB releases to soil and Wood Group's goal to move forward with the remediation of the impacts without conducting further site characterization work. To implement this plan, DEEP technical staff recommended that an application for PCB Clean-up be provided to the USEPA in accordance with 40 CFR 761.61(c) for their review and approval. As part of the 40 CFR 761.61(c) application, the DEEP technical staff recommended that a plan to address the following data gaps be included and implemented prior to completing the soil remediation project.

- The DEEP and USEPA were concerned with the two-foot sampling interval that was used during the later stage investigations to define the extent of the release area. Specifically, they are concerned that higher concentrations of PCBs could be present in shallow soil (0-6 inches).

- The DEEP requested that the potential for releases to shallow soil from the former floor drains in the original building be evaluated.

- The DEEP requested that an evaluation the drainage pipe that discharges to the swale be conducted to confirm that it does not contain PCBs or have the potential to release PCB containing materials to the subsurface soil.

A plan to address each of these items is provided in the following subsections.

2.3.1 Confirmation of PCB Extent

Prior to remediation, additional soil samples will be collected to fill in data gaps in the initial assessment of the upper and lower release areas and refine the conceptual model. Proposed sampling locations are shown on *Figure 2* and are described below.

- *Lower Release Area (Drainage Swale) – Southern Extent:* The southern extent of the lower release area is currently defined by sampling results at borings P3-109 and P3-111. Soil samples were collected at these boring locations at 2-foot intervals, and a trace concentration of PCBs (0.56 mg/kg) was detected in the 0-2 foot sample collected at boring P3-111. To confirm that elevated concentrations of PCBs are not present in shallow samples at the southern end of the lower release area, we propose to return to sampling location P3-109 and P3-111 and collect samples from 0-6 inches for analysis for PCBs.

- *Lower Release Area (Drainage Swale) – Main Channel*: The extent of the remainder of the lower release area is currently defined by sampling results at borings P3-104, P3-106, P3-107, P3-108, and P3-110. Similar to the soil samples collected to define the southern extent, soil samples were also collected at these boring locations at 2-foot intervals. To confirm that elevated concentrations of PCBs are not present in shallow soil outside of the main drainage channel, we propose to install four additional soil borings in between the previous sampling locations as presented on *Figure 2*. Soil samples will be collected at these four locations at 0-6 inches, 12-24 inches, and 24-36 inches below grade and

will be analyzed for PCBs in an iterative fashion starting with the shallowest sample to confirm that the PCB release area does not extend out of the main channel.

- *Lower Release Area (Drainage Swale) – Northern Portion*: PCBs greater than 1 mg/kg were detected at boring P3-105, located in the northern portion of the swale. To confirm the extent of this release area, four additional soil borings will be drilled around P3-105 to delineate the lateral extent of PCBs in that area. At each boring, soil samples will be collected at 0-6, 12-24, and 24-36 inches below grade and analyzed for PCBs in an iterative fashion starting with the shallowest sampling interval to delineate the extent of the PCB release area at this location.

- *Upper Release Area*: The lateral extent of PCBs was defined using data collected at several borings where samples were collected at 2-foot sampling intervals. In addition, gaps in the delineation of the PCB soil impacted area are present at the southern and northeastern edge of the release area. To confirm that elevated concentrations of PCBs are not present in shallow soil samples and confirm the extent of the release area, ten additional soil borings will be drilled in the upper release area to delineate the lateral extent of PCBs in soil in this area. Samples will be collected at 0-12, 12-24 and 24-36, and 36-48 inches and analyzed for PCBs in an iterative fashion starting with the shallowest sampling interval to delineate the extent of the PCB release area.

Collected soil samples will be extracted in accordance with Method 3540C (Soxhlet extraction) and analyzed by Method 8082. The results of this soil sampling will be used to refine our understanding of the extent of the PCB release areas and our confirmatory soil-sampling plan will be modified based on these results. Note that the proposed boring program may not completely define the extent of the PCB impacted soil present at the site. Wood Group will likely elect to move forward with the remediation phase of the project and use confirmatory soil sample results collected at the time of remediation to complete the delineation of the PCB impacted soil.

2.3.2 Drainage Pipe Evaluation

PCBs were released to the drainage swale via a drainage pipe that runs from the building to the swale. An assessment of the condition of the pipe is required to determine if remediation of the pipe and adjacent soil may be necessary. An initial evaluation of the pipe will be conducted by scanning the interior portions of the pipe with a utility pipe camera system. The camera will be used to determine the construction material of the pipe (e.g. steel or porous media), whether the pipe contains sediment, and if the pipe is intact with no cracks, joints or holes. Based on this inspection, we anticipate the following possible outcomes.

- If the pipe is determined to be non-porous, intact, and free of sediment, no further action will be recommended
- If the pipe contains sediment, but is non-porous and intact, the sediment will be removed and the waste managed with excavated soil from the lower release area.
- In the event that the pipe is damaged or porous, it will be removed and sampled as a porous media in accordance with 40 CFR 761.265. If contaminated with PCBs, the

pipe material will be disposed as a PCB remediation waste. In addition, the underlying soil will sampled for PCBs every 3 meters along the length of the pipe trench and at locations where significant cracks or damage to the pipe is observed. If PCBs are detected at a concentrations exceeding 1 mg/kg, the impacted soil will be removed and disposed with the soil from the upper release area, and post-remediation soil sampling will be conducted.

2.3.3 Floor Drain Evaluation

Sealed floor drains have been identified inside the original manufacturing building used by Kennametal. The discharge point for the floor drains has not been confirmed and it is possible that they connected to the pipe that discharges to the swale. Because of the potential for PCBs to have historically been discharged to the floor, drain network, additional characterization is necessary to evaluate the potential for releases from the floor drains to sub-slab soil.

It has been Fuss & O'Neill's experience that leaks associated with floor drain systems most commonly occur at the elbow joint just beneath the floor drain. The original manufacturing building will be inspected, and soil borings will be drilled adjacent to each location where patches in the concrete floor slab suggest that a floor drain may have been present. Soil samples will be collected from three depth intervals directly beneath the floor slab (0-12, 12-24, and 24-48 inches) and analyzed for PCBs to evaluate if releases have occurred at the potential former floor drain structures. The samples will be extracted in accordance with Method 3540C analyzed by Method 8082.

3 Clean-Up Objectives

The goal of the cleanup is to meet criteria specified by both the DEEP and United States Environmental Protection Agency (USEPA). Both sets of regulations include alternative criteria based on land use and accessibility of the soil. Clean-up criteria that will apply to the remediation of PCB-impacted soil are summarized below.

3.1 U. S. Environmental Protection Agency Criteria

The Toxic Substances Control Act (TSCA) clean-up objective for soil in high-occupancy areas is 1 mg/kg except at areas where the concrete floor of the building serves as a cap and renders the soil inaccessible (40 CFR 761.61(a)(7)). At such capped high-occupancy areas, the soil may be remediated to 10 mg/kg. TSCA also specifies additional, higher, clean-up criteria that apply to low-occupancy or restricted-use areas; however, as discussed below, Connecticut regulations still require clean-up to the 1 mg/kg and 10 mg/kg criteria.

3.2 Connecticut Department of Energy and Environmental Protection Criteria

The Connecticut Remediation Standard Regulations (RSRs) are the clean-up standards in the State of Connecticut. They also contain procedures to evaluate whether actions (e.g., remediation or institutional controls) will be required to address identified releases of hazardous substances. Soil remediation is regulated by substance and release area. For PCBs, a release area is defined as the area of polluted soil exceeding the analytical detection. The RSR Soil Remediation Standards (RCSA Section 22a-133k-2) require that polluted soil at a release area be remediated to the following criteria:

Direct Exposure Criteria

The direct exposure criteria are intended to protect human health from exposure to constituents of concern. In general, these criteria apply to soil located within fifteen feet of the ground surface unless rendered inaccessible. Soil impacted by a release of PCBs must be remediated to a concentration that is consistent with the residential direct exposure criteria (1 mg/kg for PCBs) unless the soil is rendered inaccessible and an environmental land use restriction (ELUR) is recorded to ensure that PCB-impacted soil is not disturbed. Inaccessible soil is defined as soil that is located beneath a building, more than two feet below a pavement or concrete covered surface or more than four feet below the ground surface. Such soil may be remediated to 10 mg/kg.

The RSRs also allow for the remediation of inaccessible soil to a concentration of 25 mg/kg of PCBs if the impacted area meets the definition of an "Other Restricted Area" as defined in 40 CFR 761.123. The definition requires that the area be located at least 0.1 mile from a residential/ commercial area and have access limited by man-made or natural barriers. Although access to the area is limited by fencing around the entire parcel, it is located within 0.1 mile of a residential/commercial area. As a result, inaccessible soil at the site (e.g. soil beneath the building) must be remediated to 10 mg/kg of PCBs. All other soil must be remediated to 1 mg/kg.

Pollutant Mobility Criteria

The pollutant mobility criteria are intended to prevent the pollution of groundwater through the leaching of constituents from impacted soil. These criteria generally apply to soil located above the water table. The pollutant mobility criteria are dependent upon the groundwater quality classification of the site. Since the site is located in a GA-designated area, the GA pollutant mobility criteria apply. The GA pollutant mobility criteria specifically apply to soil located above the seasonal low water table. For PCBs, compliance with the pollutant mobility criteria is based on SPLP analysis; however, in practice, the DEEP's policy is that soil containing less than 1 mg/kg of PCBs can be considered in compliance with the GA PMC, even without the performance of SPLP testing. If the soil is environmentally isolated beneath an existing building and an ELUR is recorded to prevent exposure of the impacted soil to rainwater infiltration, then the pollutant mobility criteria do not apply.

3.3 Application of the Criteria

Based on TSCA and RSR objectives for PCB cleanup, remediation of soil beneath the building and outside the building footprint will focus on meeting the criteria outlined below:

Criteria for Soil Beneath the Building

The building renders underlying soil inaccessible and environmentally isolated with respect to the RSRs. The concrete floor also meets the definition of a cap under 40 CFR 761.61(a)(7). With the building in place, both the RSRs and RCRA permit cleanup to 10 mg/kg provided appropriate deed restrictions are recorded; therefore, for areas beneath the building, the PCB clean-up goal is 10 mg/kg. Because the area beneath the building is also environmentally isolated, the Connecticut pollutant mobility criteria for PCBs will not apply provided that an ELUR is recorded on the land records rendering the PCB impact soil environmentally isolated by preventing the disturbance of the building and the polluted soil beneath it.

Criteria for Soil Outside the Building Footprint

Because the area being remediated outside the building will be accessible to site visitors and employees, both the RSRs and TSCA require PCB cleanup to 1 mg/kg. Consistent with our understanding of DEEP policy, cleanup of PCBs to 1 mg/kg will also fulfill the necessary level of cleanup to satisfy the GA PMC provision of the RSRs.

4 Clean-Up Plan

To aid the review of this application and provide necessary background information, we have provided the following information required for the review of a self-implementing clean-up as described in 40 CFR Section 761.61(a)(3):

> *(D) A clean-up plan for the site including schedule, disposal technology, and approach*

A proposed clean-up plan for the PCB impacted soil present at the site is provided in the following subsections.

4.1 Removal Operations

4.1.1 Permits and Approvals

Prior to beginning remediation, Fuss & O'Neill will coordinate with State and local agencies to determine what permits will be required to conduct excavation at the specified release areas and to obtain any necessary approvals.

4.1.2 Engineering and Design

Design drawings and technical specifications necessary to obtain permits/approvals and support bid requests to conduct the remediation will be prepared. As part of the remediation design process, a structural engineer will be consulted to address issues associated with excavating soil beneath the existing building.

4.1.3 Health and Safety Plan

A Health and Safety Plan (HASP) will be prepared pursuant to 29 CFR 1910.120 and 29 CFR 1926.65. The HASP will summarize potential site-specific hazards and specify appropriate procedures and personal protective equipment.

4.1.4 Soil Management Plan

A Soil Management Plan that outlines the soil management practices and monitoring procedures to be implemented during remediation activities will be prepared and provided to contractors. The plan will include the following elements:

- Sediment and erosion control
- Decontamination procedures
- Fugitive dust control and air monitoring
- Soil staging (in the event it becomes necessary)
- Management of PCB-impacted soil

4.1.5 Soil Excavation

Based on the data collected to date, it is anticipated that soil removal will include the following:

- *Inside the Building*: Approximately 250 cubic yards of soil (2,200 square feet by 3 feet deep) containing PCBs at concentrations greater than 10 mg/kg

- *Outside the Building*: Approximately 1,600 cubic yards of soil containing PCBs at concentrations greater than 1 mg/kg as follows:
    - 1,100 cubic yards (10,000 square feet by 3 feet deep) in the parking lot
    - 100 cubic yards (550 square feet by 4 feet deep) at the pipe outfall in the swale
    - 400 cubic yards (5,500 square feet by 2 feet deep) in the swale

In order to avoid on-site staging, in-situ waste profiling will be conducted and soil will be loaded directly into the haul vehicles for transport to an off-site disposal facility. All soil removed from the site will be managed as remediation waste containing greater than 50 mg/kg of PCBs.

4.1.6 Equipment Decontamination Procedures

Decontamination procedures described in this section will be performed on equipment that comes into contact with contaminated soil in accordance with 40 CFR Part 761.79. The following steps will be taken to assure that the equipment used in the process is either decontaminated or disposed as PCB-containing waste:

- A decontamination pad will be located adjacent to work areas. Equipment used in remediation activities will either be disposed of as PCB remediation waste or will be decontaminated by power washing, scrub brushes, and organic solvents over the decontamination pad.
- Reusable field sampling equipment will be decontaminated prior to soil collection at each sample location to minimize the potential for the cross-contamination of samples.
- Wash water will be collected in 55-gallon drums or a settling tank and disposed of off-site.
- Wipe sampling will be conducted on equipment used in remediation operation as follows:
    - Wipe sample areas will be 100 cm^2 (40 CFR 761.310)
    - One wipe sample will be collected from each square meter for equipment with a surface area of up to three square meters (40 CFR 761.302)
    - For equipment with an area of more than three square meters, three wipe samples or one wipe sample for every ten square meters (whichever results in the greater number of samples) will be collected (40 CFR 761.302)
    - When there is a collection of similar equipment, the entire collection of similar equipment will be considered a single unit of equipment when determining the number of samples to collect
    - If wipe sample results indicate the presence of PCBs at concentrations below 10 ug/cm^3, equipment can be removed from the site (40 CFR 761.79)

4.1.7 Confirmatory Soil Sampling

Upon completion of soil excavation to the extent defined by characterization samples, confirmatory sampling will be conducted to verify that PCBs have been remediated to the applicable criteria under DEEP and USEPA regulations. Sampling and analytical methods as well as clean-up objectives are summarized below.

Sampling to Demonstrate Compliance with 40 CFR 761

Sampling will be conducted over a two-dimensional, square-based grid system on a 3-meter spacing. A conceptual sampling grid is shown on *Figure 3*. Compositing will be conducted in accordance with 40 CFR 761.289(b)(1)(i), in which one composite sample is composed of up to nine grid points within an area whose maximum dimensions are two grid intervals bounded by

three grid points. Based on the ability of the analytical laboratory to consistently achieve a detection limit of 0.150 mg/kg, we propose to composite no more than six grid nodes at a time.

Sampling to Demonstrate Compliance with Connecticut's RSRs

In Connecticut, composite sampling cannot be used to verify that remediation is complete pursuant to Connecticut's Remediation Standard Regulations. Therefore, one discrete sample will be collected for each 30-foot by 30-foot area of the bottom of the excavation and every 30 linear feet of sidewall to demonstrate compliance with Connecticut's RSRs.

In the event that a composite or discrete sample result indicates that PCB impacted soil remains at a concentration exceeding, an applicable clean-up standard, additional soil will be excavated and disposed and additional confirmatory soil samples will be collected.

4.2 Environmental Land Use Restriction

An ELUR will be recorded for 523 Halfway House Road following the completion of remediation and building reconstruction. The restrictions to be established in the ELUR include:

1. No residential use

2. Unauthorized demolition of buildings that render soil inaccessible and environmentally isolated shall not be permitted.

The regulatory requirements for filing an ELUR are as follows:

- As required by 22a-133q-1(c) of the R.C.S.A. a notice of intent to record an ELUR will be published. The draft ELUR(s) will be submitted to the DEEP for review and comment prior to issuing the public notice.

- In order to ensure that the ELUR will be not be superseded by existing interests on the title of a property, all interests in the land which affect the ELUR will be irrevocably subordinated to the ELUR unless this requirement is waived by the DEEP.

- The ELUR will be submitted to the DEEP for formal approval and signature following the public notice period and the ELUR will be recorded on the local land records.

4.3 Disposal Technology

PCB remediation waste to be removed from 523 Halfway House Road is assumed to be contaminated with PCBs at concentrations greater than 50 mg/kg. Waste streams associated with the clean-up include:

- Excavated soil
- Personal protective equipment (e.g. Tyvek suits, gloves, etc.)
- Wastewater associated with the decontamination of clean-up equipment
- Equipment that cannot be decontaminated

Each of these waste streams will be transported to the CWM Chemical Services, LLC facility (a permitted hazardous waste landfill) at 1550 Balmer Road in Model City, New York or an equivalent facility licensed to accept TSCA waste. Management of each of the waste streams is summarized below.

Excavated Soil

PCB-impacted soil will be loaded directly into dump trucks as it is excavated in order to minimize any potential risks associated with on-site storage and erosion control. Existing data will be used to pre-characterize soil for disposal, and in situ waste characterization sampling will be performed prior to soil excavation activities if required by the disposal facility. In accordance with 40 CFR 761.62(a)(3), the soil will be shipped to the facility identified above using a manifest for PCBs greater than 50 mg/kg.

Personal Protective Equipment

Personal protective equipment worn in the abatement zone will be discarded in 55-gallon, steel drums or other suitable container labeled with a M_L PCB Sticker. These materials will be treated as PCB-impacted material and shipped to the facility identified above in accordance with 40 CFR 761.61(5)(iii).

Decontamination Wastewater

Water generated during the decontamination of clean-up equipment will be collected in 55-gallon, steel drums or other suitable container labeled with a M_L PCB Sticker. The drums of liquid will be treated as PCB-impacted material and shipped to the facility identified above.

4.4 Data Quality Objectives

Data quality objectives are used to ensure that data is collected in a manner that permits it to be used to evaluate a site and support decisions based on those evaluations. Procedures that will be implemented to ensure that the data quality objectives for the project were met include:

- Work will be conducted in accordance with this work plan
- Selection of analytical methods with appropriate detection limits
- Use of pre-determined sampling handling and custody procedures
- Use of pre-determined data management and documentation procedures
- Use of equipment blanks, duplicates, and laboratory matrix spikes for quality assurance/quality control (QA/QC)

- Use of Connecticut's Reasonable Confidence Protocols (RCP) and laboratory QA/QC procedures

4.4.1 PCB Analytical Methods

Soil samples will be analyzed by Phoenix Laboratory for total PCBs using Method 8082 from SW-846 and extracted using Method 3540C (Soxhlet extraction). The laboratory standard operating procedure for both methods is included in *Appendix C*.

4.4.2 Sample Collection, Handling and Data Management

Fuss & O'Neill standard operating procedures for sample collection, sample handling, documentation, and data management are included in *Appendix D*.

4.4.3 Reasonable Confidence Protocols and Laboratory QA/QC

The reasonable confidence protocol packages provided with laboratory reports will be reviewed to ensure that "reasonable confidence" is achieved on all analyses conducted. In addition, the narrative included with each laboratory report will be reviewed to confirm that there are no notes that affect the usability of the data.

4.4.4 Field QA/QC

The following QA/QC samples will be collected during both supplemental characterization and confirmatory sampling activities:

QA/QC Sample	Frequency	Analysis
Equipment Blank	1 per 20 samples submitted to the laboratory	PCBs by Method 8082
Duplicate	1 per 20 samples submitted to the laboratory	Same as primary sample
Matrix Spike	1 per 20 samples submitted to the laboratory	Same as primary sample
Matrix Spike Duplicate	1 per 20 samples submitted to the laboratory	Same as primary sample

Duplicates, matrix spikes, and matrix spike duplicates will be analyzed for the same parameters as the corresponding primary sample.

4.5 Post-Remediation Reporting

A Remedial Action Report will be prepared to document the results of the supplemental investigations the remedial activities, and the confirmation soil sampling results. The report will be supported by tables of analytical data, figures that illustrate sampling locations and laboratory analytical reports for the confirmatory soil sampling results.

4.6 Post-Remediation Groundwater Monitoring

The Remediation Standard Regulations require that compliance and post-remediation groundwater monitoring programs be implemented after the completion of remediation to demonstrate the effectiveness of the remediation program. A post-remediation groundwater monitoring plan will be prepared and implemented for all constituents of concern including PCBs following the completion of the remedial activities.

4.7 Schedule

The anticipated schedule for supplemental characterization and soil remediation is summarized below:

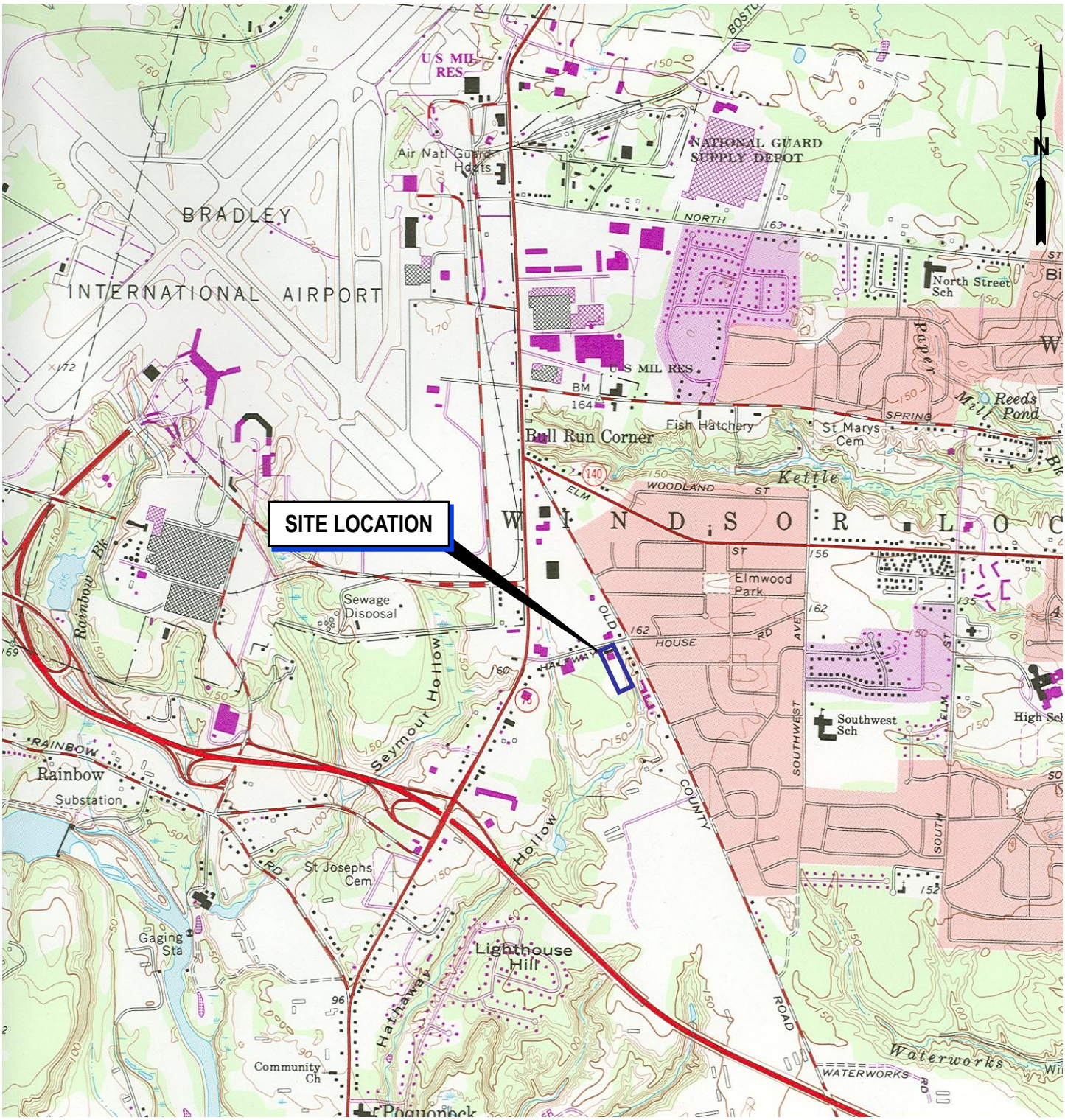
- Supplemental characterization – To be completed within two months of work plan approval
- Remediation Activities – To be initiated within four months of work plan approval
- Remediation Reporting – To be completed within two months of the completion of remediation field work
- Post Remediation Groundwater Monitoring – To be initiated within three months of the completion of remediation field work.

5 Certification

I certify that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to assess or characterize the PCB contamination at the cleanup site, will be maintained on file at Wood Group Power, located at 140 Blue Hills Avenue in Bloomfield, Connecticut, and will be available for EPA inspection.

Signature of Site Owner	Date: 10/14/2013
Name (print or type): Gus Eghneim	Title: Vice President, QHSE
Company: Wood Group Power Inc.	
Signature of Environmental Professional	Date: 10/14/2013
Name (print or type): Brent J. Henebry	Title: LEP
Company: Fuss & O'Neill, Inc	

Figures



MAP REFERENCE:
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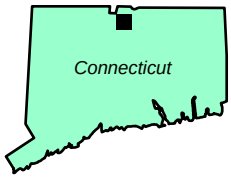
7.5 MINUTE SERIES TOPOGRAPHIC MAP:
WINDSOR LOCKS, CONN. 1964 PHOTOREVISED 1984



Quadrangle Location

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0 1000 2000
GRAPHIC SCALE

SCALE: 1"=2000'

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SITE LOCATION MAP
523 HALFWAY HOUSE ROAD
WINDSOR LOCKS CONNECTICUT

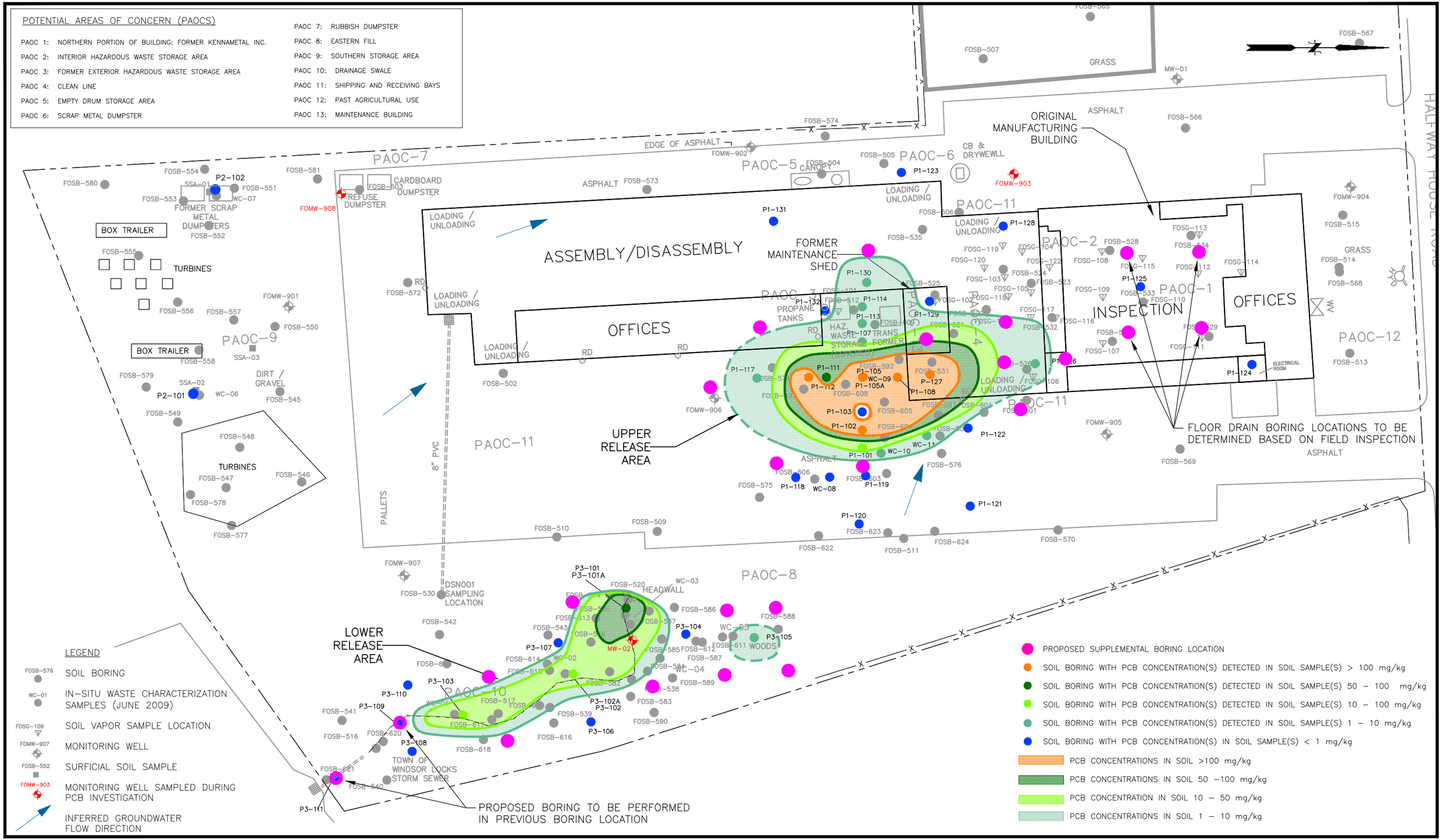
PROJ. No: 20051184R71
DATE: OCTOBER 2013

FIGURE 1

File Path: J:\DWG\P20051184R70\Environmental\Plan\20051184R70_EWD01-PCB.dwg, Layout: Figure 2 Mon, Oct 07, 2013 - 9:37 AM User: kvanderveer
CTB: PCB COLORS
LMAN: STP
MS VIEW: MPLOT
UCS: BOT

POTENTIAL AREAS OF CONCERN (PAOCS)

PAOC 1: NORTHERN PORTION OF BUILDING: FORMER KENNAMETAL INC.
PAOC 2: INTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 3: FORMER EXTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 4: CLEAN LINE
PAOC 5: EMPTY DRUM STORAGE AREA
PAOC 6: SCRAP METAL DUMPSTER
PAOC 7: RUBBISH DUMPSTER
PAOC 8: EASTERN FILL
PAOC 9: SOUTHERN STORAGE AREA
PAOC 10: DRAINAGE SWALE
PAOC 11: SHIPPING AND RECEIVING BAYS
PAOC 12: PAST AGRICULTURAL USE
PAOC 13: MAINTENANCE BUILDING



LEGEND

- SOIL BORING
- IN-SITU WASTE CHARACTERIZATION SAMPLES (JUNE 2009)
- SOIL VAPOR SAMPLE LOCATION
- MONITORING WELL
- SURFICIAL SOIL SAMPLE
- MONITORING WELL SAMPLED DURING PCB INVESTIGATION
- INFERRED GROUNDWATER FLOW DIRECTION

- PROPOSED SUPPLEMENTAL BORING LOCATION
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) > 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 50 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 10 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 1 – 10 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) IN SOIL SAMPLE(S) < 1 mg/kg
- PCB CONCENTRATIONS IN SOIL >100 mg/kg
- PCB CONCENTRATIONS IN SOIL 50 –100 mg/kg
- PCB CONCENTRATION IN SOIL 10 – 50 mg/kg
- PCB CONCENTRATIONS IN SOIL 1 – 10 mg/kg

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

MAP REFERENCE:

1. FACILITY FEATURES FROM "MAP SHOWING LAND OWNED BY TURBINE ENGINE SERVICES" PREPARED BY NERIANI SURVEYING, 8/19/95 REVISED 6/30/97 AND OBSERVATIONS DURING SITE WALKOVER ON 1/15/98.
2. SAMPLE LOCATIONS AND INTERIOR BUILDING FEATURES MEASURED IN FIELD 12/05 TO 10/09.

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.:
VERT.:
0 25 50
GRAPHIC SCALE

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WOOD GROUP POWER, INC.
APPLICATION FOR CLEAN-UP OF PCB REMEDIATION WASTE
SUPPLEMENTAL PCB BORING LOCATIONS
523 HALFWAYHOUSE ROAD WINDSOR LOCKS, CONNECTICUT

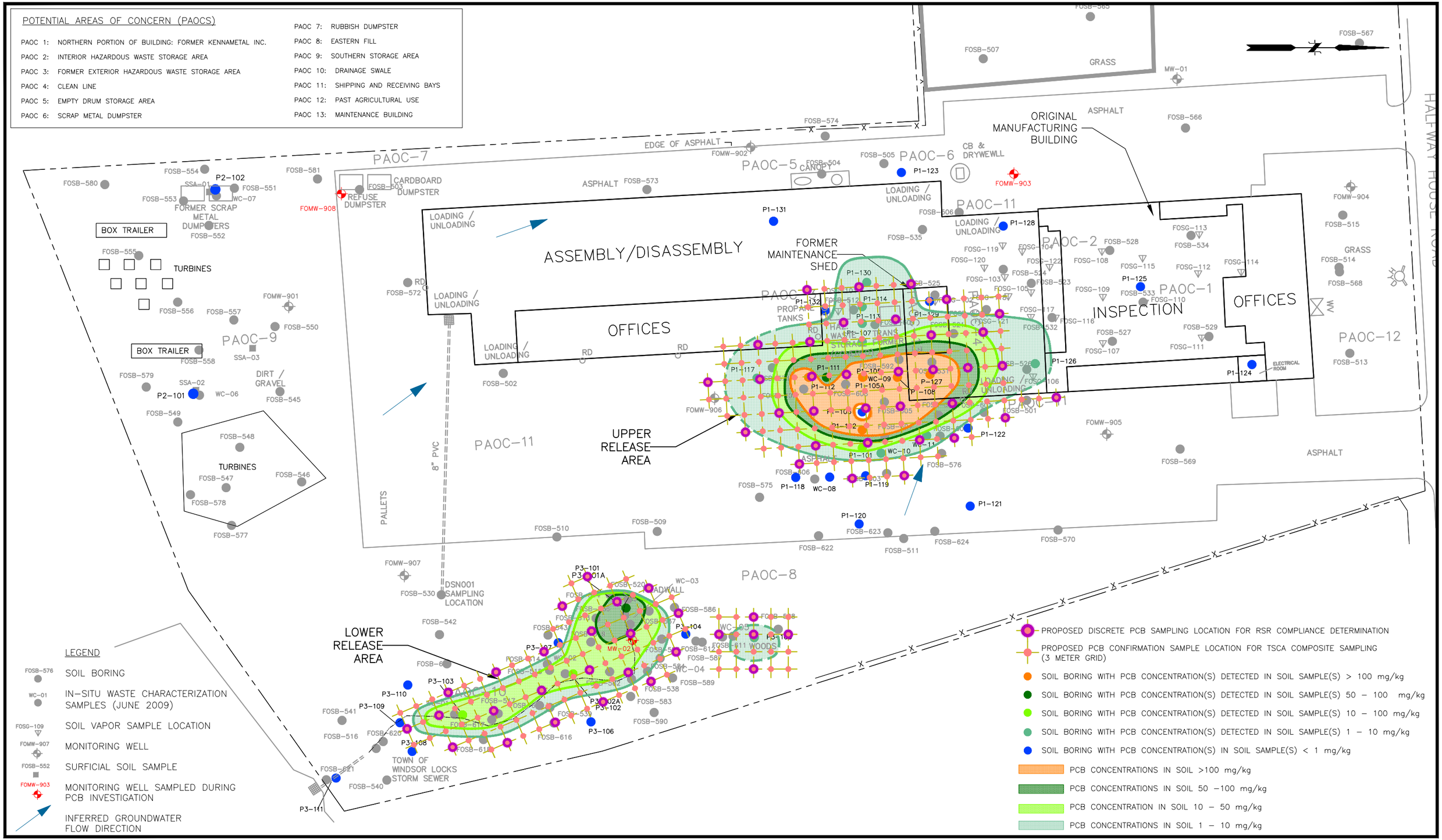
PROJ. No.: 20051184R70
DATE: OCTOBER 2013

FIGURE 2

File Path: J:\DWG\P20051184R70\Environmental\Plan\20051184R70_EWD01-PCB.dwg, Layout: Figure 3 Mon, Oct 07, 2013 - 9:39 AM User: kvanderveer
CTB: PCB COLORS
LMAN: STP
MS VIEW: MPLOT
UCS: ROT

POTENTIAL AREAS OF CONCERN (PAOCS)

PAOC 1: NORTHERN PORTION OF BUILDING: FORMER KENNAMETAL INC.
PAOC 2: INTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 3: FORMER EXTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 4: CLEAN LINE
PAOC 5: EMPTY DRUM STORAGE AREA
PAOC 6: SCRAP METAL DUMPSTER
PAOC 7: RUBBISH DUMPSTER
PAOC 8: EASTERN FILL
PAOC 9: SOUTHERN STORAGE AREA
PAOC 10: DRAINAGE SWALE
PAOC 11: SHIPPING AND RECEIVING BAYS
PAOC 12: PAST AGRICULTURAL USE
PAOC 13: MAINTENANCE BUILDING



LEGEND

- FOSB-576 — SOIL BORING
- WC-01 — IN-SITU WASTE CHARACTERIZATION SAMPLES (JUNE 2009)
- FOSG-109 — SOIL VAPOR SAMPLE LOCATION
- FOMW-907 — MONITORING WELL
- FOSB-552 — SURFICIAL SOIL SAMPLE
- FOMW-903 — MONITORING WELL SAMPLED DURING PCB INVESTIGATION
- INFERRED GROUNDWATER FLOW DIRECTION

- PROPOSED DISCRETE PCB SAMPLING LOCATION FOR RSR COMPLIANCE DETERMINATION
- PROPOSED PCB CONFIRMATION SAMPLE LOCATION FOR TSCA COMPOSITE SAMPLING (3 METER GRID)
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) > 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 50 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 10 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 1 – 10 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) IN SOIL SAMPLE(S) < 1 mg/kg
- PCB CONCENTRATIONS IN SOIL >100 mg/kg
- PCB CONCENTRATIONS IN SOIL 50 –100 mg/kg
- PCB CONCENTRATION IN SOIL 10 – 50 mg/kg
- PCB CONCENTRATIONS IN SOIL 1 – 10 mg/kg

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

MAP REFERENCE:

1. FACILITY FEATURES FROM "MAP SHOWING LAND OWNED BY TURBINE ENGINE SERVICES" PREPARED BY NERIANI SURVEYING, 8/19/95 REVISED 6/30/97 AND OBSERVATIONS DURING SITE WALKOVER ON 1/15/98.

2. SAMPLE LOCATIONS AND INTERIOR BUILDING FEATURES MEASURED IN FIELD 12/05 TO 10/09.

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.:
VERT.:
0 25 50
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WOOD GROUP POWER, INC.
APPLICATION FOR CLEAN-UP OF PCB REMEDIATION WASTE
PROPOSED POST-EXCAVATION VERIFICATION SAMPLING PLAN
523 HALFWAYHOUSE ROAD WINDSOR LOCKS, CONNECTICUT

PROJ. No.: 20051184R70
DATE: OCTOBER 2013

FIGURE 3

FUSS & O'NEILL

Appendix A

PCB Release Areas
Conceptual Model

FUSS & O'NEILL

PCB Release Areas Conceptual Model

Wood Group Power, Inc.
523 Halfway House Road
Windsor Locks, Connecticut

November 2009

The Wood Group Power site is being investigated and remediated under Connecticut's voluntary clean-up program. In July 2009, polychlorinated biphenyls (PCBs) were discovered during routine waste characterization sampling prior to the completion of a soil remediation project. This conceptual model documents investigations conducted to characterize the PCB release areas.

I. Background Information

Physical Description

The PCB release areas include soil beneath and adjacent to the east-central portion of the site building (upper release area) and in a drainage swale east of the facility (lower release area). These release areas, shown on *Figure 1*, are associated with the following potential areas of concern (PAOCs) previously investigated at the site and summarized in the Phase III Environmental Site Assessment (Fuss & O'Neill, 2006) and Remedial Action Plan (Fuss & O'Neill, 2006):

Upper PCB Release Area

- *PAOC 1 – Former Kennametal Inc*: The historical Kennametal facility was an approximately 15,800 square-foot building that was subsequently used by Wood Group for offices and inspection/shipping.

- *PAOC 13 – Former Maintenance Building*: An approximately 1,000 square foot maintenance building was constructed during Kennametal's occupation of the site. The former maintenance building is currently housed within an addition to the main building.

Lower PCB Release Area (Swale)

- *PAOC 10 – Drainage Swale*: The drainage swale is located on the southeastern portion of the site. A drainage pipe located at the north end of the swale is believed to have connected to a former catch basin adjacent to a former loading bay that was historically used by Kennametal.

Historical Information/Processes

The PCB release areas were identified during in-situ waste characterization sampling conducted prior to remediating releases of tungsten and cobalt at both the upper and lower release areas. PCB Aroclors detected at the site include Aroclors -1248 and -1254 (see *Section II*, beginning on

page 5, for investigation details). According to the Agency for Toxic Substance and Disease Registry, these Aroclors are used in the following applications:

- *Aroclor-1248*: hydraulic fluids, vacuum pumps, plasticizers in rubber, and adhesives
- *Aroclor-1254*: used in a wide variety of applications including capacitors, transformers, hydraulic fluids, vacuum pumps, plasticizers in rubber and synthetic resins, adhesives, wax extenders, dedusting agents, inks, cutting oils, pesticide extenders, sealants, and caulking compounds

Following the identification of the PCB release, Phase I data previously compiled (aerial photos, historical reports, and files obtained from Town and State offices) were reviewed in an effort to identify any potential PCB sources at the site. To supplement the existing data, aerial photos available at the State Archives were reviewed in greater detail, and Town permits were reviewed for additional activities that may have been associated with PCB-containing equipment. Historical information pertaining to the PCB release areas is summarized on *Table 1*. The site's development history is also shown on *Figure 2*. Based on this information and sampling data (see *Section II*, beginning on page 5), we have identified the following potential sources of PCBs:

- The location of a dark area visible on the 1970 aerial photograph in an unpaved area south of the original building corresponds with the highest concentrations of PCBs detected on the site. The area appears to be a shadow, but, in light of the recent data, may represent an area where liquid had been discharged. The discharge of wastewater to the ground was a common practice for many industries during this time period. For example, Kennametal used lagoons to manage wastes at their facility in Bedford, Pennsylvania from 1965 to 1981 (USEPA, 1999 – Environmental Indicator Determination Form, CA725).

- The PCB release areas generally correspond with the tungsten/cobalt release areas, suggesting that they may have been associated with the historical manufacture of tungsten-carbide tools by Kennametal.

- A biennial hazardous waste report for 1983 signed by a Kennametal representative indicates that approximately 600 gallons per year of waste oil was generated from the vacuum pumps used in the sintering process. Sintering is the process of fusing metallic powders at high temperatures. Vacuum pumps are used to create a vacuum in the furnace. The vacuum minimizes oxidation of the product, minimizes contamination by carbon and other gases present in air, and facilitates the maintenance of uniform temperatures. As noted above, vacuum pumps are one of the known uses for PCB oils containing both Aroclors-1248 and -1254.

- PCB-containing capacitors were present on-site in the "front" of the shop. Three were removed in 1983 by Kennametal when one leaked and caused the other two to fault. The capacitors were reportedly disposed of off-site. During a 2009 inspection, an electrical room was identified in the northeast corner of the former shop. Electrical boxes and holes where historical equipment had been mounted were observed on the north wall of the shop both inside and outside the electrical room. This area is believed to have been the most likely location for the capacitors.

Since each of these sources existed during the timeframe that Kennametal occupied the site (1965 – 1985), we believe that the release occurred during Kennametal's occupation of the site.

Constituents of Concern

PCBs are the primary constituents of concern at these release areas. In addition to PCBs, several other compounds associated with the historical manufacture of tungsten-carbide tools. These compounds, which are addressed in technical memoranda (TMs) for PAOCs 1, 10, and 13, include:

- Extractable total petroleum hydrocarbons (ETPH)
- Tungsten
- Cobalt
- To a lesser extent, other metals including arsenic, cadmium, chromium, lead, mercury, nickel, and silver

Potential Release Mechanisms

Historical information and analytical results suggest that PCBs near the building were released to the ground surface. Based on the site's operational history, potential release mechanisms include:

- Leaks from containers stored on the ground
- Spills during transport of materials
- Discharge of wastes to the ground surface

PCBs were most likely released to the swale via the discharge pipe located at the north end of the swale. During investigation of the swale, the pipe trench was traced using ground penetrating radar (GPR). The survey indicated that the pipe follows a path northwest from the headwall and outfall toward the southeast corner of the original site building. Historical mapping depicted a catch basin adjacent to the southeastern loading bay. It is possible that the pipe discharged stormwater from that location. If so, any surface spills or direct discharges of PCB-containing materials to the catch basin would have been transported directly to the swale. The floor of the original Kennametal facility also appeared to have sealed floor drains. It is also possible that the floor drains could have discharged to the swale.

Applicable Regulatory Criteria

The releases of PCBs are subject to both State and Federal regulations:

- Connecticut Department of Environmental Protection's (CTDEP's) Remediation Standard Regulations (RSRs)
- Title 40 of the Code of Federal Regulations (CFR) Section 761 – United States Environmental Protection Agency's (USEPA's) Toxic Substances Control Act (TSCA)

Connecticut Remediation Standard Regulations (RSRs)

The site has been entered into a voluntary clean-up program administered by the CTDEP and is being evaluated with respect to Connecticut's Remediation Standard Regulations (RSRs). The

site is located in a GA groundwater classification area. An environmental land use restriction (ELUR) limiting the site to industrial/commercial land use is planned. Based on this information, the following RSR criteria apply to the PCB release areas:

Soil Criteria

- Residential direct exposure criteria (1 mg/kg for PCBs)
- Industrial/commercial direct exposure criteria for inaccessible soils impacted by PCBs (10 mg/kg)
- GA pollutant mobility criteria (0.0005 mg/L for PCBs)

The RSRs allow for inaccessible soils impacted by PCBs to be remediated to 25 mg/kg if the area meets the definition of an "other restricted area" as defined by 40 CFR 761.123; however, that definition requires that the area be at least 0.1 km from a residential/commercial area. Residences on Old County Road are less than 0.1 km from the release areas; therefore, this exception does not apply.

Groundwater Criteria

- Background (non-detect for PCBs)
- Groundwater protection criteria (0.0005 mg/L for PCBs)
- Surface water protection criteria (0.0005 mg/L for PCBs)

Toxic Substances Control Act (TSCA)

40 CFR 761 pertains to the management of PCBs. Subpart D, which specifically addresses the disposal of PCB wastes, is also referred to as the Megarule and considers releases of PCBs at concentrations of 50 parts per million (ppm, equivalent to mg/kg) or greater to constitute "disposal." Because the concentration of PCBs in soil at this site is greater than 50 ppm, the Megarule would apply to PCB remediation. The investigation approach and extent of clean-up will depend primarily on the use of the property (characterized by the length of occupancy) and the type of waste material that is contaminated with PCBs:

- *Use of Property*: Based on the definitions in 40 CFR 761.61(a), the area is classified as a high-occupancy area. Such areas are occupied, on average 16.8 or more hours per week.

- *Type of Waste Material*: The material at the site is classified as bulk PCB remediation waste, which includes in-situ soil.

Based on this information, the site may be characterized using the self-implementing option for on-site clean-up and disposal of the PCBs in soil. The clean-up objectives will be 1 mg/kg except at areas where an appropriate "cap" (e.g. the concrete floor of the building) is present. At such capped areas, the soil may be remediated to 10 mg/kg.

The TSCA regulations allow for clean-up to 25 mg/kg if the area is demonstrated to be low-occupancy; however, CTDEP regulations will still require clean-up to 10 mg/kg, so there is no benefit to rendering an area low-occupancy.

II. Investigations

Investigations contributing to the development of the conceptual model for this AOC are presented below. Sampling locations are shown on *Figure 1*. Analytical data are summarized in *Table 2*. Boring logs are included as *Attachment B*. Laboratory reports are included as *Attachment C*.

GPR Survey of Drainage Pipe Discharging to the Swale
Fuss & O'Neill – March 2006

On March 3, 2006 a geophysical survey was conducted to confirm the path of the pipe leading from the headwall toward the former Kennametal portion of the building. The geophysical investigation included use of a MetroTech and a GPR survey using Geophysical Survey Systems, Inc. SIR-2000™ and a 500 Megahertz (MHZ) antenna.

The survey indicated that the pipe follows a path northwest from the headwall and outfall toward the southeast corner of the original site building where a former catch basin is depicted on historical mapping. Due to the presence of snow and salt adjacent to the building, the GPR antenna could not penetrate to the depth of the pipe to confirm its connection to the building.

Phase II/III Investigations of PAOCs 1, 10, and 13 (Former Kennametal Operations and Drainage Swale)
Fuss & O'Neill – 2006-2009

In 2006, Fuss & O'Neill identified and characterized two areas impacted by Kennametal's historical manufacture of tungsten-carbide tools.

PAOCs 1 & 13: Former Kennametal Operations and Former Maintenance Building (Upper PCB Release Area)

Cobalt and tungsten, metals common in the manufacture of tungsten-carbide tools, were identified in the top foot of soil near the center of the site. The highest concentrations (up to 1,090 mg/kg of tungsten and 453 mg/kg of cobalt) were located just southeast of the former maintenance building at borings FOSB-531 and -592. SPLP analyses indicated that soil also exceeded the GA pollutant mobility criteria for tungsten and cobalt, and two remedial alternatives were recommended:

- Outside the building, excavation of soil exceeding applicable RSR criteria was recommended.

- Soil beneath the building that exceeds applicable RSR criteria is rendered inaccessible and environmentally isolated by the building; therefore, the recording of an ELUR was recommended to allow this impacted soil to remain in place. The ELUR prevents the demolition of the building, without first submitting a plan and obtaining CTDEP approval to address the impacted soil present beneath the building.

PAOC 10: Drainage Swale (Lower PCB Release Area)

Cobalt, tungsten, ETPH and other metals (including arsenic, cadmium, chromium, lead, mercury, nickel, and silver) were identified at elevated concentrations in drainage swale soil. The highest concentrations of tungsten and cobalt (up to 9,050 mg/kg of tungsten and 479 mg/kg of cobalt) were detected at the pipe outfall at the north end of the swale. Based on the distribution of constituents the release was inferred to be the result of historic discharges from the pipe. SPLP analyses indicated that metals and petroleum hydrocarbons exceeded the GA pollutant mobility criteria. Remediation by excavation was recommended to address exceedances of both the GA pollutant mobility criteria and residential direct exposure criteria.

Waste Characterization Sampling

Fuss & O'Neill – June 2009

Prior to conducting remediation at PAOCs 1, 10, and 13, Fuss & O'Neill conducted in-situ waste characterization soil sampling so that excavated soil could be loaded directly into trucks and transported to a disposal facility without the need for on-site stockpiling. The waste characterization sampling included the collection of ten discrete samples for ETPH analysis and two composite samples for PCB analysis. When PCBs were detected in one of the composite samples at 770 mg/kg, the corresponding discrete samples were also analyzed for PCBs. The ETPH and PCB results are summarized below:

Waste Characterization Sample	ETPH Concentration (mg/kg)	PCB Concentration (mg/kg)	
		Discrete	Composite
Upper Release Area			
WC-06/WC-07*	ND<11*	0.67 (Aroclor 1248)*	770 (Aroclor 1254)
WC-08	ND<10	ND<0.340	
WC-09	2,100	15,000 (Aroclor 1254)	
WC-10	ND<10	1.4 (Aroclor 1254)	
WC-11	ND<11	0.6 (Aroclor 1254)	
Lower Release Area			
WC-01	18	----	0.84 (Aroclor 1254)
WC-02	ND <11	----	
WC-03	51	----	
WC-04	ND <11	----	
WC-05	26	----	

*WC-06/WC-07 was collected from the former storage area at the southern end of the site (PAOC 9, which was to be remediated concurrent with the other PAOCs) and was included in the initial composite. Subsequent sampling did not identify detectable PCBs in this area.

This data indicated that a release of PCBs had occurred in the vicinity of WC-09, located just southeast of the former maintenance building and near FOSB-592, where some of the higher concentrations of tungsten and cobalt were historically detected. As shown above, the highest PCB concentration also corresponded with elevated ETPH, suggesting a potential association with petroleum products. Plans for remediation were put on hold and additional investigations of the PCB release areas were conducted.

PCB Investigation (Soil, Groundwater, and ETPH Correlation)
Fuss & O'Neill – September 2009

The initial model of the PCB release inferred a limited release area in the vicinity of sampling location WC-09, with concentrations decreasing away from a central "hot-spot" and stormwater transport of PCBs to the swale via the historical catch basin. To evaluate this preliminary model, Fuss & O'Neill conducted additional soil and groundwater sampling in the vicinity of WC-09 and in the swale as discussed below.

Assessment of PCBs in Soil at the Upper Release Area

Sampling Program

Fuss & O'Neill implemented an iterative sampling program along two lines of borings centered on WC-09, the sampling location exhibiting the highest concentration of PCBs during the July 2009 waste characterization sampling. The sampling program was designed to serve as the basis for a three-meter grid that meets objectives of PCB characterization under the Megarule. Sampling was conducted at the following 14 locations:

- P1-105 was advanced at WC-09 to provide a depth profile
- A line of five borings was advanced north to south at three-meter intervals, crossing P1-105 (P1-108, -109, -110, -111, and -112)
- A line of eight borings was advanced east to west at three-meter intervals, crossing P1-105 (P1-101, -102, -103, -104, -106, -107, -113, and -114)

Each boring was advanced to a depth of five feet below grade and soil samples were collected from the following intervals (0-1 foot, 1-2 feet, 2-3 feet, and 3-5 feet). Initially, the 0-1 foot and 1-2 foot samples from seven borings were analyzed for PCBs. Based on the results of those analyses, additional sample locations and depths were analyzed for PCBs to fill data gaps.

Analytical Results

Soil encountered during drilling was generally a yellowish-brown sand. PCBs were detected in soil at concentrations ranging from 0.68 mg/kg to 2,500 mg/kg. Aroclors-1248 and -1254 were detected; however, in many instances, the amount of each individual Aroclor present could not be determined and only total PCBs were reported. The distribution of PCBs in soil is discussed below:

- *Highest Concentration*: The highest concentration was detected at P1-105 (WC-09) in soil from the 0-1 foot interval. At this location, the sand exhibited a whitish color and pasty consistency. Although the source of this material could not be conclusively identified, it is suspected to be associated with the historical manufacture of tungsten-carbide tools. Tungsten-carbide is naturally grayish in color. The material was analyzed for tungsten, which was detected at an elevated concentration of 241 mg/kg.

- *Lateral Distribution*: Although P1-105 exhibited the highest concentration of PCBs, the distribution of PCBs at other locations is not consistent with the model of a single, small hot-spot that produces concentric rings of decreasing concentrations. Instead, the data

suggest a broader release area with variable concentrations. The extent of PCBs was not defined laterally to a concentration below 1 mg/kg. Additional investigations (including sampling beneath the building) were recommended to determine the lateral extent of PCB-impacted soil.

- *Vertical Distribution*: In general, the analytical results indicated that PCB concentrations decreased significantly with depth. In all but a few instances, PCBs were not detected below a depth of two feet. For example, soil from the 3-5 foot interval at P1-105 exhibited higher concentrations of PCBs (68 mg/kg) than the samples from 1-2 feet (23 mg/kg) and 2-3 feet (1.6 mg/kg). It was suspected that some of the detections of PCBs below two feet were the result of PCB-impacted material collapsing into the soil boring between samples. This was confirmed during subsequent sampling in October 2009, and the result from P1-105 (3-5 feet) is not considered to be a valid data point. PCB impacted soil is anticipated to be limited to the top three to four feet of soil.

Assessment of PCBs in Soil in the Lower Release Area (SWALE)

Shallow soil samples (0-1 foot) were collected by hand from three locations within the swale (P3-101, -102, and -103) and submitted for PCB analysis. PCBs (only Aroclor-1254) were detected at concentrations ranging from 13 mg/kg to 38 mg/kg. The highest concentrations were detected at upstream locations P3-101 and P3-102. Based on these results, it appears that PCBs from the upper release area were transported to the drainage swale, most likely by stormwater flow from the catch basin formerly located south of the Kennametal building or from drains inside the building.

PCB/ETPH Correlation

Once the PCB data had been reviewed, several samples exhibiting a range of PCB concentrations were analyzed for ETPH to determine if a correlation existed between ETPH and PCBs. Samples from the waste characterization sample and the September 2009 investigation that were analyzed for both PCBs and ETPH are summarized below:

Sample ID	PCB Concentration (mg/kg)	ETPH Concentration (mg/kg)
WC-09	15,000	2,100
P1-108 (0.5'-1')	410	460
P1-112 (0.5'-1')	190	51
P1-111 (0.5'-1')	54	24
P1-101 (0.5'-1')	20	ND<10
P1-114 (0.5'-1')	2.6	ND<10
WC-10	1.4	ND<10
WC-11	0.6	ND<11
WC-08	ND<0.340	ND<10

As shown by the data above, the higher concentrations of PCBs also exhibit elevated ETPH. In addition, ETPH is not detected where PCBs were reported at 20 mg/kg or less. Based on this information, we conclude the following:

- The presence of ETPH with higher concentrations of PCBs suggests a petroleum source (such as vacuum pump oils, lubricating oils, or cutting oils) rather than materials such as adhesives, pesticides, or caulking compounds.

- The relatively high concentration of PCBs relative to ETPH suggests that PCBs were present in the source material as a primary component rather than as an additive.

Groundwater Evaluation

Groundwater samples were collected from three site monitoring wells to determine if groundwater had been impacted by PCBs:

- FOMW-903, located downgradient from the upper release area
- MW-2, located in the drainage swale
- FOMW-908, located on the southwestern portion of the site (sampled as part of the confirmation that PCBs were not present on the southern portion of the site)

The monitoring wells were sampled using peristaltic pumps and low-flow sampling methods. Prior to sampling, field parameters (pH, specific conductance, temperature, turbidity, dissolved oxygen, and oxidation/reduction potential,) were stabilized to ensure that samples representative of the surrounding aquifer were collected. The samples were submitted for PCB analysis. PCBs were not detected in the groundwater samples, suggesting that groundwater at the site has not been impacted by the PCB release.

Supplemental PCB Soil Investigation
Fuss & O'Neill – October 2009

The September 2009 investigation demonstrated that the PCBs were more widely distributed than initially anticipated; therefore, supplemental investigations focused on a broader area in an effort to delineate the extent of PCB impacts. Investigations of the upper and lower release areas are discussed below.

Upper Release Area

Sampling Program

Seventeen soil borings (P1-117 through -132 and P1-105A) were drilled through the concrete floor of the building and in asphalt-paved areas around the building to characterize the extent of PCBs in the upper release area. Most locations were drilled using a direct-push drill rig and the borings were advanced to a depth of six feet below grade. Two locations, P1-124 (located in the electrical room) and P1-132 (located between the building and storage shed) were not accessible by the drill rig and were sampled using a coring machine and hand-Geoprobe.

Sampling was conducted as follows:

- At each boring location, a soil sample from 0-2 feet was collected and analyzed for PCBs to assess the potential for a release.

- Soil samples were also collected from 2-4 feet and 4-6 feet and analyzed in an iterative manner to provide depth profile data if PCBs were detected in the shallow sample.

Variations from the general sampling plan to achieve secondary objectives include:

- At P1-124, a concrete subfloor was encountered; therefore, soil samples were collected from material between the floors (0.4-0.6 feet) and beneath the subfloor (0.7-2 feet).

- Boring P1-105A was drilled to confirm that the apparent increase in PCBs at depth at P1-105 was anomalous and likely the result of shallow soil falling into the boring between samples. Only a 3-5 foot sample was collected at this location.

Analytical Results

PCBs were detected in 5 of the 17 borings at concentrations ranging from 0.89 mg/kg to 450 mg/kg. As before, Aroclors-1248 and -1254 were detected but could not be consistently quantified individually. The greatest concentration was detected at P-127 in the shallow soil sample (0.5-2 feet). The lateral distribution of PCBs, based on all soil samples collected is shown on *Figure 1*. The release area extends beneath the more recent additions of the building but does not appear to extend beneath the Kennametal building (see *Figure 2* for construction dates). This suggests that the release to shallow soil occurred prior to construction of the additions. The lateral extent of PCBs in soil was not completely defined south of boring P1-117 and east of boring P1-126.

Vertical profiling indicates that PCB-impacted soil is limited to the top three to four feet of soil.

Lower Release Area (Swale)

Sampling Program

Soil samples were collected at ten locations P3-101A, -102A, and -104 through -111) within the swale to characterize the vertical and lateral extent of PCBs. The rationale for sampling locations is summarized below:

- P3-101A and -102A: Depth profile sampling was conducted at former sampling locations P3-101 and -102.
- P3-109 and -111: Additional sample locations along the main stormwater channel to determine the downstream extent of PCBs.
- P3-104 and -105: Sample locations "upstream" of the main stormwater channel but within the swale to determine the lateral extent of PCBs.
- P3-106, -107, -108, and -110: Sample locations along the sides of the main channel to assess the lateral extent of PCBs.

Samples were collected by hand from three depths (0-2 feet, 2-4 feet, and 4-6 feet). At each boring location, the sample from 0-2 feet was collected using a shovel and analyzed for PCBs to assess the potential for a release. Soil samples from 2-4 feet and 4-6 feet, collected using a hand auger and hand-Geoprobe respectively, were analyzed in an iterative manner to provide depth profile data if PCBs were detected in the shallow sample.

Analytical Results

PCBs were detected within the main stormwater channel between the discharge pipe headwall and the southern property boundary at concentrations ranging from 0.53 mg/kg to 56 mg/kg. The PCBs consisted primarily of Aroclor-1254. Aroclor-1248 was detected at one location (P3-101A, 2-4 feet).

The greatest concentrations of PCBs were detected in soil from 0-2 feet at the discharge pipe (P1-101A). Concentrations decreased downstream to non-detect at P3-109 and 0.56 mg/kg at P3-111 (located at the southern property boundary). PCBs were not detected along the sides of the swale but were present "upstream" of the main channel at P3-105. This pattern mimics the distribution of tungsten in this portion of the site. Impacted soil has not been delineated in this direction.

Vertical profiling indicates that PCBs are limited to the top four feet of soil adjacent to the discharge pipe and the top two feet of soil throughout the rest of the channel.

III. AOC Findings

A release of PCBs has occurred to shallow soil (generally less than four feet deep below grade) beneath and adjacent to the building and in the drainage swale on the eastern portion of the site. The PCBs are believed to be associated with the historical manufacture of tungsten-carbide tools by Kennametal and released to the ground surface south of the original site building prior to Kennametal's transfer of the site in the mid-1980s. PCBs most likely entered the swale via a sub-surface pipe that connected to either a catch basin at the southwest corner of the original building or drains inside the building or both. This conceptual model is supported by the following lines of evidence:

- *Historical Documentation*: *Section 1* and *Table 1* summarize the documentation used to reconstruct the history of the release areas. Key elements that support the model of a release associated with Kennametal's operations include:

    - PCB manufacture was banned and use regulated by CTDEP in 1976 and USEPA in 1978
    - Kennametal occupied the site from 1965 to the mid-1980s
    - The upper release area corresponds with a dark area on a 1970 aerial photograph
    - Kennametal used lagoons for the disposal of wastes at a tungsten-carbide tool manufacturing facility in Pennsylvania (establishes standard practice of discharging wastes to the ground)
    - PCB-containing capacitors were present on-site; one leaking capacitor and two faulty capacitors were removed in 1983 and reportedly disposed of off-site
    - The manufacture of tungsten-carbide tools requires the use of vacuum pump oils, lubricating oils, cutting oils, and possibly hydraulic oils and dedusting agents, all of which could have contained PCBs
    - Historical mapping depicts a catch basin at the southeast corner of the Kennametal building (potential migration pathway to the swale)

  - Buildings over the upper release area were constructed in the 1990s (PCBs were not likely used following construction and would not have been likely to migrate through the concrete floor)

- *Physical Inspection of the Site*: No visible evidence of a potential PCB or petroleum release was observed in either the upper or lower release areas. Two migration pathways were noted: the discharge pipe to the swale and sealed floor drains in the original manufacturing building constructed by Kennametal.

- *GPR Survey*: A partial GPR trace of the pipe discharging to the swale indicated that it led toward the southeast corner of the original manufacturing building, supporting the model of PCBs being discharged to the swale via a catch basin or historic floor drains.

- *Physical Observations During Drilling*: The only visible evidence of a release was a whitish, pasty material at sampling location P1-105 (where PCBs were detected at the highest concentration). Tungsten was detected in a sample of this material at 241 mg/kg.

- *Soil Analytical Results*: Soil data indicate that the highest concentration of PCBs are located in the upper release area, at the location of dark area on the 1970 aerial photograph. PCB impacts extend beneath the newer building additions but do not appear to extend beneath the original manufacturing building. In the swale, the highest concentrations of PCBs are located at the discharge pipe outfall. In both areas, PCBs appear to be limited to the upper four feet of soil and, as shown on *Figure 3*, generally correlate with releases of tungsten and cobalt associated with tungsten-carbide tool manufacture. Petroleum compounds have also been identified with the highest PCB concentrations, suggesting an oil-based source.

The PCB release has been well characterized; however, the lateral extent has not been fully delineated at three locations: P1-117 (at the western edge of the upper release area), southeast of P1-126, and around P3-105 (located in the northern portion of the swale). Additional sampling, either as part of further investigations or remediation confirmation sampling, is recommended at these locations to complete delineation of the release areas.

IV. Regulatory Compliance Analysis

The release of PCBs is subject to the following regulations:

- Connecticut General Statue 22a-6u (Significant Environmental Hazard)
- CTDEP's RSRs
- TSCA/Megarule

Significant Environmental Hazard Notification

The detected concentration of PCBs at WC-09 constituted a Significant Environmental Hazard under Connecticut General Statute 22a-6u, which requires notification to the site owner (within 7 days of identification of the hazard) and the CTDEP (within 90 days of the owner being notified) if a substance is present within two feet of the ground surface at a concentration at or above 30 times the criteria applicable to the site's use. The industrial/commercial direct

exposure criteria for PCBs is 10 mg/kg. The Significant Environmental Hazard notification limit (30 times the industrial/commercial direct exposure criteria) is 300 mg/kg. Sample WC-09 contained PCBs at a concentration of 15,000 mg/kg.

Final laboratory reports were received and reviewed on July 6, 2009. Wood Group was notified of the hazard in writing on July 13, 2009. The CTDEP was notified by Wood Group in writing on October 13, 2009.

RSR Compliance

The RSRs require that the nature and extent of release areas be fully characterized prior to making a final determination compliance with the RSRs. At this point in the investigation process, release areas have not been fully delineated; however, we believe that the characterization is sufficient to conduct an evaluation of actions necessary to comply with the RSRs.

Soil Compliance Evaluation

Direct Exposure Criteria

The site building renders a portion of the upper release area inaccessible. Under the RSRs, this area may be remediated to 10 mg/kg (shown on *Figure 1* by the light green line). Remaining areas will need to be remediated to the residential direct exposure criteria of 1 mg/kg. Soil may also be rendered inaccessible by asphalt; however, as discussed below, remediation would still be necessary in asphalt-paved areas to meet the pollutant mobility criteria.

Pollutant Mobility Criteria

Compliance with the GA pollutant mobility criteria for PCBs (0.0005 mg/L) is determined through SPLP analysis. Seven soil samples exhibiting detectable PCBs were analyzed for SPLP PCBs with the following results:

Sample ID	Total PCBs (mg/kg)	SPLP PCBs (mg/L)
P1-108 (0.5'-1')	410	**0.2**
P1-190 (0.5'-1')	190	**0.017**
P1-111 (0.5'-1')	54	**0.0021**
P1-101 (0.5'-1')	20	**0.0033**
P1-114 (0.5'-1')	2.6	**0.00058**
P1-130 (2'-4')	1.3	ND<0.0005
P1-119 (0.5'-2')	0.89	ND<0.0005

*Bold/shaded values indicate concentrations greater than the GA pollutant mobility criteria of 0.0005 mg/L

Based on these data, it appears that PCBs with a total concentration greater than 1.5 mg/kg to 2 mg/kg are likely to exceed the GA pollutant mobility criteria. Outside the building, soil exceeding the GA pollutant mobility criteria will need to be remediated. Where such soil is located beneath the building, it is considered environmentally isolated. The recording of an ELUR would allow such soil to remain in place by preventing the demolition of the building

without first submitting a plan and obtaining CTDEP approval to address the impacted soil present beneath the building.

Groundwater Compliance Evaluation

Groundwater samples collected in September 2009 indicate that groundwater has not been impacted by PCBs; however, a minimum of four consecutive quarters of groundwater sampling will be necessary to demonstrate compliance with the groundwater and surface water protection criteria in the RSRs.

TSCA/Megarule

The Megarule specifies characterization objectives and clean-up criteria that depend on the use of the property and the type of waste material that is contaminated with PCBs.

Characterization Requirements

As specified in 40 CFR 761.61(a)(3), at least 30 days prior to the date clean-up of the site begins, the USEPA must be notified. Such notification is to include:

- Nature of the contamination
- Summary of the investigation procedures and results (which will be subject to USEPA's acceptance)
- Location and extent of impacted areas
- Clean-up plan
- Written certification signed by the owner of the site and the party conducting the cleanup that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to characterize the release are on file at the location designated in the certificate and available for USEPA inspection. Samples should be extracted using either EPA SW-846 Method 3500B/3540C (Soxhlet extraction) or Method 3500B/3550B and analyzed using EPA SW-846 Method 8082 or prepare a comparison study that meets TSCA requirements.

Clean-Up Criteria

The clean-up objective for soil in high-occupancy areas is 1 mg/kg except at areas where the concrete floor of the building renders the soil inaccessible. At such capped areas, the soil may be remediated to 10 mg/kg. The Megarule specifies additional, higher, clean-up criteria that apply to low-occupancy or restricted-use areas; however, the RSRs will still require clean-up to the 1 mg/kg and 10 mg/kg criteria because of the release areas' proximity to residences.

Preliminary Evaluation of Remedial Options

In order to meet objectives of both the RSRs and the Megarule, remediation of PCB-impacted soil will be required. Options for meeting the above objectives inside and outside the building are summarized below:

- *Outside the Building*: We recommend excavating soil outside the building that exceeds 1 mg/kg of PCBs. We anticipate that this will achieve objectives of the Megarule and the direct exposure and pollutant mobility criteria in the RSRs.

- *Inside the Building*: Several options are feasible inside the building. Soil with PCBs exceeding 1 mg/kg could be excavated. Alternatively, soil exceeding 10 mg/kg of PCBs could be excavated and soil with 1 mg/kg to 10 mg/kg could be rendered inaccessible and environmentally isolated by the building floor slab providing an ELUR is recorded to prevent the demolition of the building without first submitting a plan and obtaining CTDEP approval to address the impacted soil present beneath the building.

V. Conclusions And Recommendations

During routine waste characterization sampling for remediation of tungsten and cobalt, PCBs were discovered. Significant characterization has been completed, and, although the lateral extent has not been completely delineated in three locations, the data gathered is sufficient to render conclusions and recommendations for meeting State and Federal clean-up objectives:

- The release of PCBs is believed to be associated with Kennametal's historical manufacture of tungsten-carbide tools, most likely vacuum pump oils, lubricating oils, cutting oils, and possibly hydraulic oils and dedusting agents, all of which could have contained PCBs. PCB-containing capacitors were also present on-site.

- Two areas have been impacted, an upper area adjacent to and beneath the site building and a lower area consisting of a drainage swale. PCBs are believed to have been released to the ground in the upper area and discharged to the lower area via a storm drain (and possibly floor drains inside the facility).

- Reported concentrations of PCBs are greater than 50 mg/kg, requiring that the release be managed in accordance with the Megarule. Concentrations also exceed RSR direct exposure criteria and pollutant mobility criteria. Remediation will be required to meet both State and Federal criteria.

- Potential remedial alternatives include excavating soil with more than 1 mg/kg of PCBs and rendering soil with 1 mg/kg to 10 mg/kg of PCBs inaccessible.

- Groundwater does not appear to have been impacted. Additional monitoring will be necessary to demonstrate compliance with the RSRs.

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Table 1
Historical Information
PCB Release Area
Former Wood Group Power, Inc.
Windsor Locks, Connecticut

Date	History	Source
1951	Site is agricultural	Aerial photographs
1965	Kennametal constructed a concrete block building on the northern portion of the site and began manufacturing tungsten carbide tools. The building is L-shaped with a northern arm approx. 105' x 28' and an eastern arm approx. 119' x 53'. The area around the building does not appear to be paved. Storage of several items is visible to the southwest of the building. The area south of the building has been cleared.	City street directories Aerial photographs
1970	A building addition has been constructed and the building is now rectangular with dimensions of approximate 105' (east to west) x 147' (north to south). An area approximately 50' around the building appears to be paved. A dark stained area is present on the asphalt leading from the southwest bay door south and east to the edge of the paved area. Another dark area is apparent in the unpaved area approximately 105' south of the building's southeast corner. This location corresponds to the highest concentration of PCBs detected in the upper release area.	Aerial photograph (see Attachment A)
1972	A permit is issued to construct a steel storage building on the site. This is the former maintenance building (AOC 13) that is later enclosed inside the main facility.	Town of Windsor Locks
1975	An area of darker soil is visible south of the southeast corner of the maintenance building in the same location as the dark area noted in the 1970 aerial photo. A fence line appears to run east to west through this area.	Aerial photograph (see Attachment A)
1976	Connecticut bans manufacture of PCBs and regulates use.	CTDEP
1978	U.S. Environmental Protection Agency (EPA) bans manufacture of PCBs.	USEPA
1980	Storage is evident on the south side of the former maintenance building.	Aerial photograph
1982	RCRA inspection indicates Kennametal occupies the site and generates approximately 50 gallons per month of waste oil from compressors and furnaces.	CTDEP files
1983	Three capacitors are taken out of service. A rupture in one caused the others to fault. Liquid was contained by a fiberglass tray under the leaking capacitor and cleaned up with Speedi-Dri. The waste and capacitors are sent to Kennametal's Latrobe, PA facility for selection of a disposal site. A CTDEP inspector notes 17 additional capacitors in the front of the shop (inferred to be the north end, adjacent to the offices) in two banks. No other PCB items are identified during the inspection.	CTDEP, Waste Management Bureau, PCB Program
1984	A USEPA biennial hazardous waste report for 1983 signed by a Kennametal representative indicates that approximately 600 gallons per year of waste oil was generated from the vacuum pumps used in the sintering process.	CTDEP files

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Table 1
Historical Information
PCB Release Area
Former Wood Group Power, Inc.
Windsor Locks, Connecticut

Date	History	Source
1985	Turbine Engine Services acquires the site in September 1985. Kennametal conducted phase-out of operations from 1984 to February 1985. A 2002 CTDEP inspection report indicated that Turbine Engine Services had removed carbide waste left behind by Kennametal but did not believe that anything other than carbide had been left behind.	CTDEP files
1986	Kennametal is no longer listed as a site occupant in street directories. A CTDEP inspection in May 1986 identified Turbine Engine Services as the site occupant. The inspection reports note that Turbine Engine Services would be trying to determine if Kennametal had disposed of unknown waste through floor drains into a storm drain. Turbine Engine Services' wastes are picked up by licensed haulers. The area east and south of the former maintenance building is not paved.	City street directories CTDEP files Aerial photographs.
1987	Permit issued to Turbine Engine Services for re-tap of transformer. A historical survey map depicts a catch basin at the loading bay on the southeast corner of the former Kennametal building. No associated piping is detailed.	Town files Survey Map by Neriani Surveryors
1988-1990	A permit is issued to construct a metal building. A second building is constructed to the south of the existing building by 1990, and the pavement is extended around the new building.	Town files Aerial photographs
1993	Turbine Engine Services is listed as occupying the site.	City street directories
1993-1995	A permit is issued to construct a 16,500 square foot, pre-engineered addition. The addition is completed on the southern building by 1995 and the pavement is extended around the addition. It does not include the addition that eventually connects the two buildings.	Town files Aerial photographs
1995	A map of the property shows a catch basin at the loading bay on the southeast corner of the former Kennametal building. No associated piping is detailed.	Survey Map by Neriani Surveryors
2000	The site is occupied by Wood Group Turbine Engine Services	City street directories

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Table 2
Summary of PCBs Detected in Soil
Wood Group Inc. - 523 Halfway House Road
Windsor Locks, Connecticut

			PCBs, Total (mg/kg)			PCBs, SPLP (mg/L)		
			Total PCBs	Aroclor 1248	Aroclor 1254	Total PCBs	Aroclor 1248	Aroclor 1254
GA Pollutant Mobility Criteria			NA	NA	NA	0.0005	0.0005	0.0005
Residential Direct Exposure Criteria			1	1	1	NA	NA	NA
Site ID	Collection Date	Depth (feet)						
Upper Release Area: PAOCs 1 and 10 - Former Kennametal and Former Maintenance Building								
WC-08	6/16/2009	0.25 - 1	ND	<0.34	<0.34	----	----	----
WC-10	6/16/2009	0.25 - 1	**1.4**	<0.35	**1.4**	----	----	----
WC-11	6/16/2009	0.25 - 1	**0.6**	<0.35	**0.6**	----	----	----
P1-101	8/12/2009	0.5 - 1	**20**	*	*	**0.0033**	*	*
		1 - 2	**2.6**	*	*	----	----	----
		2 - 3	ND	<0.34	<0.34	----	----	----
		3 - 5	ND	<0.35	<0.35	----	----	----
P1-102	8/12/2009	0.5 - 1	**130**	*	*	----	----	----
		1 - 2	ND	<0.35	<0.35	----	----	----
P1-103	8/12/2009	0.5 - 1	**0.68**	<0.35	<0.35	----	----	----
		1 - 2	ND	<0.35	<0.35	----	----	----
WC-09	6/16/2009	0.25 - 1	**15,000**	<3600	**15000**	----	----	----
P1-105	8/12/2009	0.5 - 1	**2,500**	*	*	----	----	----
		1 - 2	**23**	*	*	----	----	----
		2 - 3	**1.6**	<0.34	**1.6**	----	----	----
P1-105A	10/5/2009	3 - 5	ND	<0.34	<0.34	----	----	----
P1-107	8/12/2009	0 - 1	**3.8**	*	*	----	----	----
		1 - 2	**6.1**	*	*	----	----	----
		2 - 3	**9.6**	*	*	----	----	----
		3 - 5	ND	<0.35	<0.35	----	----	----
P1-108	8/12/2009	0.5 - 1	**410**	*	*	**0.2**	*	*
		1 - 2	**0.83**	*	*	----	----	----
		2 - 3	ND	<340	<340	----	----	----
P1-111	8/12/2009	0.5 - 1	**54**	*	*	**0.0021**	*	*
		1 - 2	**2.6**	*	*	----	----	----
		2 - 3	ND	<0.34	<0.34	----	----	----
P1-112	8/12/2009	0.5 - 1	**190**	*	*	**0.017**	*	*
		1 - 2	0.67	*	*	----	----	----
P1-113	8/12/2009	0.5 - 1	**4.7**	*	*	----	----	----
		1 - 2	ND	<0.34	<0.34	----	----	----
P1-114	8/12/2009	0.5 - 1	**2.6**	*	*	**0.00058**	0.00058	<0.0005
		1 - 2	**7.1**	*	*	----	----	----
		2 - 3	ND	<0.34	<0.34	----	----	----
		3 - 4	ND	<0.36	<0.36	----	----	----
P1-117	10/2/2009	0.5 - 2	**8.3**	*	*	----	----	----
		2 - 4	ND	<0.34	<0.34	----	----	----
P1-118	10/2/2009	0.5 - 2	ND	<0.35	<0.35	----	----	----
P1-119	10/2/2009	0.5 - 2	**0.89**	*	*	ND	<0.0005	<0.0005
		2 - 4	ND	<0.34	<0.34	----	----	----
P1-120	10/2/2009	0.5 - 2	ND	<0.36	<0.36	----	----	----
P1-121	10/2/2009	0.5 - 2	ND	<0.35	<0.35	----	----	----
P1-122	10/2/2009	0.5 - 2	ND	<0.35	<0.35	----	----	----
P1-123	10/2/2009	0.5 - 2	ND	<0.36	<0.36	----	----	----
P1-124	10/5/2009	0.4 - 0.6	ND	<0.33	<0.33	----	----	----
		0.7 - 2	ND	<0.34	<0.34	----	----	----
P1-125	10/5/2009	0.5 - 2	ND	<0.34	<0.34	----	----	----
P1-126	10/5/2009	0.5 - 2	**3.6**	*	*	----	----	----
		2 - 4	**8.5**	<3.5	**8.5**	----	----	----
		4 - 6	ND	<0.33	<0.33	----	----	----
P1-127	10/5/2009	0.5 - 2	**450**	**450**	<350	----	----	----
		2 - 4	ND	<0.34	<0.34	----	----	----
P1-128	10/5/2009	0.5 - 2	ND	<0.35	<0.35	----	----	----
P1-129	10/5/2009	0.5 - 2	ND	<0.33	<0.33	----	----	----
P1-130	10/5/2009	0.5 - 2	**2.6**	*	*	----	----	----
		2 - 4	**1.3**	**1.3**	<0.34	ND	<0.0005	<0.0005
		4 - 6	ND	<0.34	<0.34	----	----	----
P1-131	10/5/2009	0.5 - 2	ND	<0.34	<0.34	----	----	----
P1-132	10/5/2009	0.3 - 2	ND	<0.34	<0.34	----	----	----
Lower Release Area: PAOC 10 - Drainage Swale								
P3-101	8/12/2009	0 - 1	**33**	<4.8	**33**	----	----	----
P3-101A	10/1/2009	0 - 2	**56**	<42	**56**	----	----	----
		2 - 4	**0.53**	**0.53**	<0.37	----	----	----
		4 - 6	ND	<0.37	<0.37	----	----	----
P3-102	8/12/2009	0 - 1	**38**	<4.0	**38**	----	----	----
P3-102A	10/1/2009	0 - 2	**1.7**	<0.37	**1.7**	----	----	----
		2 - 4	ND	<0.37	<0.37	----	----	----
P3-103	8/12/2009	0 - 1	**13**	<4.6	**13**	----	----	----
P3-104	10/1/2009	0 - 2	ND	<0.37	<0.37	----	----	----
P3-105	10/1/2009	0 - 2	**5.3**	<4.0	**5.3**	----	----	----
		2 - 4	ND	<0.34	<0.34	----	----	----
P3-106	10/1/2009	0 - 2	ND	<0.36	<0.36	----	----	----
P3-107	10/1/2009	0 - 2	ND	<0.36	<0.36	----	----	----
P3-108	10/1/2009	0 - 2	ND	<0.37	<0.37	----	----	----
P3-109	10/1/2009	0 - 2	ND	<0.39	<0.39	----	----	----
P3-110	10/1/2009	0 - 2	ND	<0.34	<0.34	----	----	----
P3-111	10/1/2009	0 - 2	**0.56**	<0.48	**0.56**	----	----	----
		2 - 4	ND	<0.40	<400	----	----	----

Notes:
Units: mg=microgram; kg=kilogram; L=liter
---- = not analyzed
< = constituent not detected at the specified laboratory reporting limit
Bold value indicates detection
Blue value highlights identified aroclor
*More than one Arochlor was present and the specific Arochlor was no longer recognizable. The PCB pattern most closely resemebled a mixture of the Arochlors 1248 and 1254.

File Path: J:\DWG\P2005\11841R70\Environmental\Plan\20051184SAM-1009-pcb.dwg, Layout: CONTOURS (2) Tue, Nov 03, 2009 - 12:31 PM User: sochelt
CTB: PCB COLORS
LMAN: STP
MS VIEW: MPLOT
UCS: ROT

POTENTIAL AREAS OF CONCERN (PAOCS)

PAOC 1: NORTHERN PORTION OF BUILDING: FORMER KENNAMETAL INC.
PAOC 2: INTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 3: FORMER EXTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 4: CLEAN LINE
PAOC 5: EMPTY DRUM STORAGE AREA
PAOC 6: SCRAP METAL DUMPSTER
PAOC 7: RUBBISH DUMPSTER
PAOC 8: EASTERN FILL
PAOC 9: SOUTHERN STORAGE AREA
PAOC 10: DRAINAGE SWALE
PAOC 11: SHIPPING AND RECEIVING BAYS
PAOC 12: PAST AGRICULTURAL USE
PAOC 13: MAINTENANCE BUILDING

ORIGINAL MANUFACTURING BUILDING
FORMER MAINTENANCE SHED
UPPER RELEASE AREA
LOWER RELEASE AREA
ASSEMBLY/DISASSEMBLY
OFFICES
INSPECTION
OFFICES
PROPANE TANKS
HAZ WASTE STORAGE
TRANS FORMER
BOX TRAILER
BOX TRAILER
TURBINES
TURBINES
FORMER SCRAP METAL DUMPSTERS
CARDBOARD DUMPSTER
REFUSE DUMPSTER
CB & DRYWELL
CANOPY
LOADING / UNLOADING
ASPHALT
GRASS
DIRT / GRAVEL
WOODS
EDGE OF ASPHALT
8" PVC
PALLETS
HALFWAY HOUSE ROAD
ELECTRICAL ROOM
DSN001 SAMPLING LOCATION
HEADWALL
TOWN OF WINDSOR LOCKS STORM SEWER
PAOC-1
PAOC-2
PAOC-3
PAOC-4
PAOC-5
PAOC-6
PAOC-7
PAOC-8
PAOC-9
PAOC-10
PAOC-11
PAOC-12

LEGEND

FOSB-576 — SOIL BORING
WC-01 — IN-SITU WASTE CHARACTERIZATION SAMPLES (JUNE 2009)
FOSC-109 — SOIL VAPOR SAMPLE LOCATION
FOMW-907 — MONITORING WELL
FOSB-552 — SURFICIAL SOIL SAMPLE
FOMW-903 — MONITORING WELL SAMPLED DURING PCB INVESTIGATION
INFERRED GROUNDWATER FLOW DIRECTION

- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) > 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 50 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 10 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 1 – 10 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) IN SOIL SAMPLE(S) ND – 1 mg/kg

PCB CONCENTRATIONS IN SOIL >100 mg/kg
PCB CONCENTRATIONS IN SOIL 50 –100 mg/kg
PCB CONCENTRATION IN SOIL 10 – 50 mg/kg
PCB CONCENTRATIONS IN SOIL 1 – 10 mg/kg

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

MAP REFERENCE:

1. FACILITY FEATURES FROM "MAP SHOWING LAND OWNED BY TURBINE ENGINE SERVICES" PREPARED BY NERIANI SURVEYING, 8/19/95 REVISED 6/30/97 AND OBSERVATIONS DURING SITE WALKOVER ON 1/15/98.

2. SAMPLE LOCATIONS AND INTERIOR BUILDING FEATURES MEASURED IN FIELD 12/05 TO 10/09.

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.:
VERT.:
0 25 50
GRAPHIC SCALE

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WOOD GROUP POWER, INC.
PCB RELEASE AREA
REMEDIAL ACTION PLAN AMENDMENT
523 HALFWAYHOUSE ROAD WINDSOR LOCKS, CONNECTICUT

PROJ. No.: 20051184R70
DATE: NOVEMBER 2009

FIGURE 1

File Path: J:\DWG\P2005\11841R70\Environmental\Plan\20051184R70_SAM01.dwg, Layout: CONTOURS (2) Tue, Nov 03, 2009 - 12:35 PM User: srochelt
CTB: PCB COLORS
LMAN: STP
MS VIEW: MPLOT
UCS: ROT

POTENTIAL AREAS OF CONCERN (PAOCS)

PAOC 1: NORTHERN PORTION OF BUILDING: FORMER KENNAMETAL INC.
PAOC 2: INTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 3: FORMER EXTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 4: CLEAN LINE
PAOC 5: EMPTY DRUM STORAGE AREA
PAOC 6: SCRAP METAL DUMPSTER
PAOC 7: RUBBISH DUMPSTER
PAOC 8: EASTERN FILL
PAOC 9: SOUTHERN STORAGE AREA
PAOC 10: DRAINAGE SWALE
PAOC 11: SHIPPING AND RECEIVING BAYS
PAOC 12: PAST AGRICULTURAL USE
PAOC 13: MAINTENANCE BUILDING

GRASS
EDGE OF ASPHALT
PAOC-7
PAOC-6
PAOC-5
CANOPY
CB & DRYWELL
CATCH BASIN AND DRY WELL EXISTING AFTER 1995
ORIGINAL MANUFACTURING BUILDING
ASPHALT
HALFWAY HOUSE ROAD
CARDBOARD DUMPSTER
REFUSE DUMPSTER
FORMER SCRAP METAL DUMPSTERS
BOX TRAILER
TURBINES
BOX TRAILER
PAOC-9
DIRT / GRAVEL
LOADING / UNLOADING
ASSEMBLY/DISASSEMBLY
~1995
FORMER MAINTENANCE SHED
~1990
PAOC-3
~1990
PROPANE TANKS
HAZ. WASTE STORAGE (COVERED)
TRANS FORMER
~1972
PAOC-1
PAOC-4
AFTER 1995
PAOC-11
PAOC-2
~1970
PAOC-1
INSPECTION
OFFICES
GRASS
~1965
ELECTRICAL ROOM
PAOC-12
OFFICES
RD
~1995
8" PVC
PAOC-11
DARK STAINED AREA ~1970
ASPHALT
CATCH BASIN EXISTING FROM 1987 TO 1995
PALLETS
SN001 SAMPLING LOCATION
PAOC-8
TIE ADWALL
INFERRED PIPE TRENCH INDENTIFIED BY GPR IN 2006
WOODS
PAOC-10
TOWN OF WINDSOR LOCKS STORM SEWER

LEGEND

SITE DEVELOPMENT THAT OCCURRED DURING KENNA METAL OCCUPATION (1965–1985)

SITE DEVELOPMENT THAT OCCURRED DURING TURBINE ENGINE SERVICES/WOOD GROUP OCCUPATION (1985–PRESENT)

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

MAP REFERENCE:

1. FACILITY FEATURES FROM "MAP SHOWING LAND OWNED BY TURBINE ENGINE SERVICES" PREPARED BY NERIANI SURVEYING, 8/19/95 REVISED 6/30/97 AND OBSERVATIONS DURING SITE WALKOVER ON 1/15/98.

2. SAMPLE LOCATIONS AND INTERIOR BUILDING FEATURES MEASURED IN FIELD 12/05 TO 10/09.

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.:
VERT.:
0 35 70
GRAPHIC SCALE

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WOOD GROUP POWER, INC.
SITE DEVELOPMENT HISTORY
REMEDIAL ACTION PLAN AMENDMENT
523 HALFWAYHOUSE ROAD WINDSOR LOCKS, CONNECTICUT

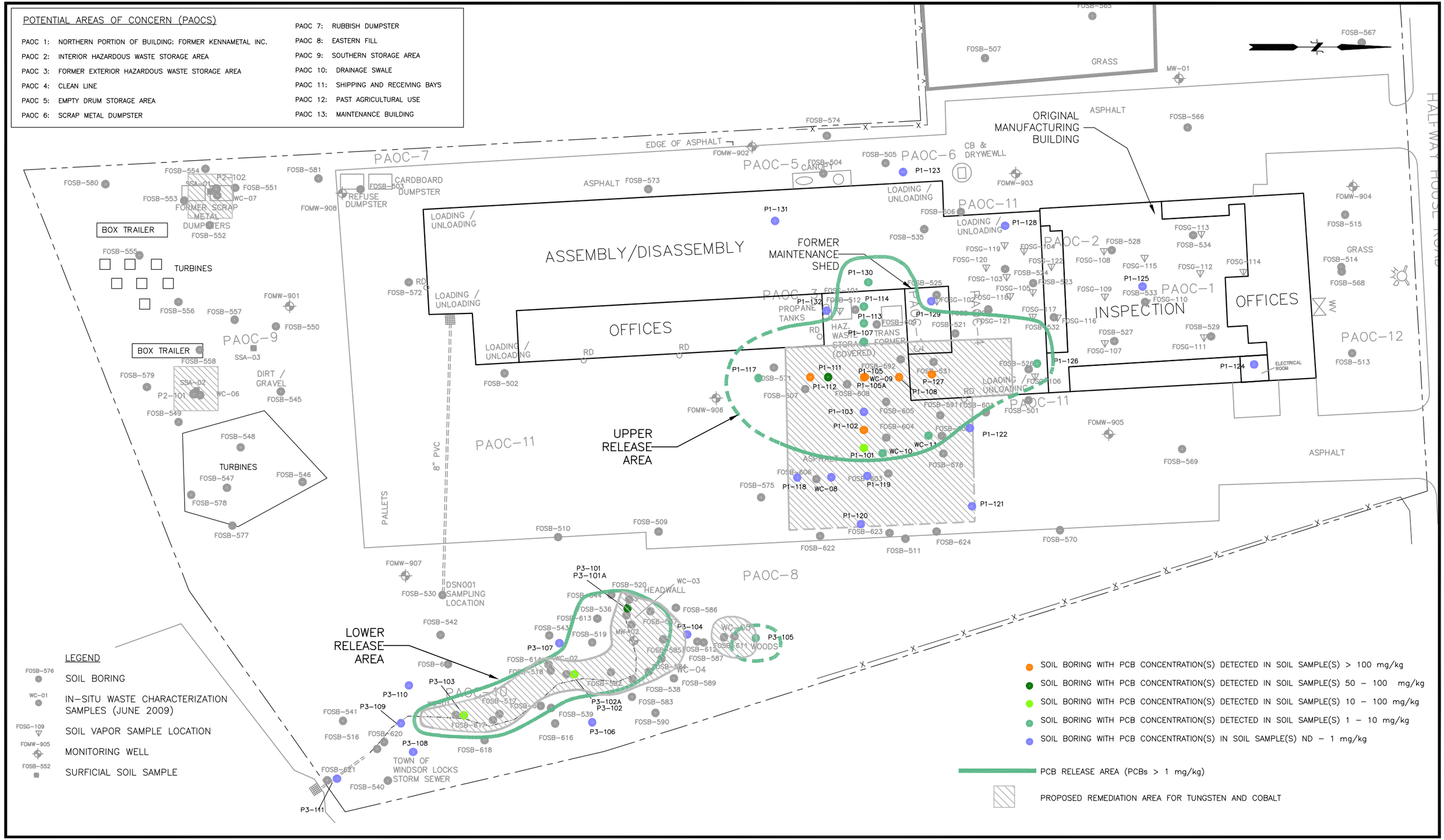
PROJ. No.: 20051184R70
DATE: NOVEMBER 2009

FIGURE 2

File Path: J:\DWG\P2005\11184R70\Environmental\Plan\20051184R70_SAM02.dwg, Layout: CONTOURS (2) Tue, Nov 03, 2009 - 12:39 PM User: srochelt
CTB: PCB COLORS
LMAN: STP
MS VIEW: MPLOT
UCS: ROT

POTENTIAL AREAS OF CONCERN (PAOCS)

PAOC 1: NORTHERN PORTION OF BUILDING: FORMER KENNAMETAL INC.
PAOC 2: INTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 3: FORMER EXTERIOR HAZARDOUS WASTE STORAGE AREA
PAOC 4: CLEAN LINE
PAOC 5: EMPTY DRUM STORAGE AREA
PAOC 6: SCRAP METAL DUMPSTER
PAOC 7: RUBBISH DUMPSTER
PAOC 8: EASTERN FILL
PAOC 9: SOUTHERN STORAGE AREA
PAOC 10: DRAINAGE SWALE
PAOC 11: SHIPPING AND RECEIVING BAYS
PAOC 12: PAST AGRICULTURAL USE
PAOC 13: MAINTENANCE BUILDING



LEGEND

- FOSB-576 — SOIL BORING
- WC-01 — IN-SITU WASTE CHARACTERIZATION SAMPLES (JUNE 2009)
- FOSG-109 — SOIL VAPOR SAMPLE LOCATION
- FOMW-905 — MONITORING WELL
- FOSB-552 — SURFICIAL SOIL SAMPLE

- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) > 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 50 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 10 – 100 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) DETECTED IN SOIL SAMPLE(S) 1 – 10 mg/kg
- SOIL BORING WITH PCB CONCENTRATION(S) IN SOIL SAMPLE(S) ND – 1 mg/kg

PCB RELEASE AREA (PCBs > 1 mg/kg)

PROPOSED REMEDIATION AREA FOR TUNGSTEN AND COBALT

No.	DATE	DESCRIPTION	BY
1.			

REVISIONS

PROJ. MANAGER:
CHIEF DESIGNER:
REVIEWED BY: DATE

MAP REFERENCE:

1. FACILITY FEATURES FROM "MAP SHOWING LAND OWNED BY TURBINE ENGINE SERVICES" PREPARED BY NERIANI SURVEYING, 8/19/95 REVISED 6/30/97 AND OBSERVATIONS DURING SITE WALKOVER ON 1/15/98.
2. SAMPLE LOCATIONS AND INTERIOR BUILDING FEATURES MEASURED IN FIELD 12/05 TO 10/09.

SCALE:
HORZ.: 1" = 50'
VERT.:
DATUM:
HORZ.:
VERT.:
0 25 50
GRAPHIC SCALE

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WOOD GROUP POWER, INC.
PCB AND TUNGSTEN RELEASE AREAS
REMEDIAL ACTION PLAN AMENDMENT
523 HALFWAYHOUSE ROAD WINDSOR LOCKS, CONNECTICUT

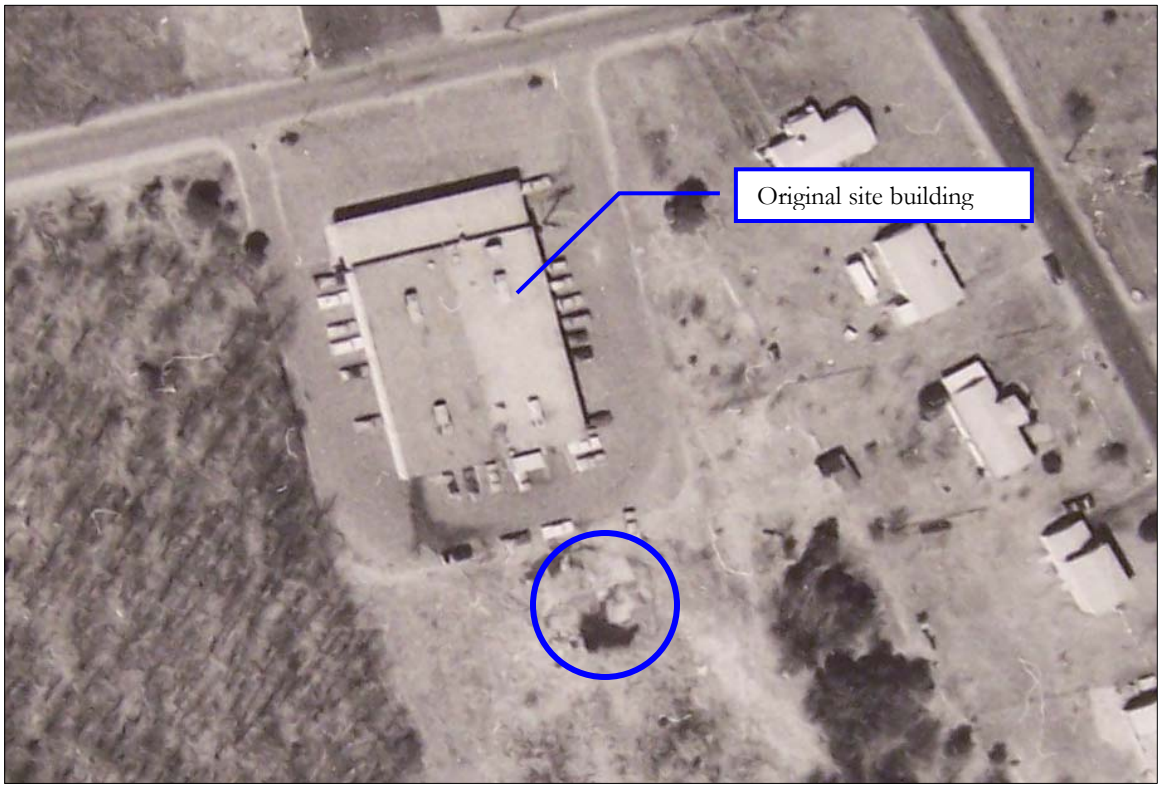
PROJ. No.: 20051184R70
DATE: NOVEMBER 2009

FIGURE 3

FUSS & O'NEILL

Attachment A

1970 and 1975 Aerial Photographs



1970 Aerial Photograph – Suspected PCB source area highlighted

1975 Aerial Photograph – Suspected PCB source area highlighted

FUSS & O'NEILL

Attachment B

Boring Logs

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-101
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe

Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Moterial fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-01		0.25-0.5': STONE, process.		K1	0 ppm
		-02		0.5-1.0': SAND, C-M, dark yellowish brown (10YR 4/4), dry. Loose. No odor.			0 ppm
				Same as above, yellowish brown (10YR 5/4).			
-2	2	-03		Some os above.			0 ppm
		-04		Some os above.		SP	0 ppm
-4	4			End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-102
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusol.

Datum:
Ground Elevotion: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Methad: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Moterial fm: 0.50' to: 5.00'
type: fm: lo:
type: fm: to:
type: fm: to:

Elevotion	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-05, -06		0.25-0.5': STONE, process.		K1	0 ppm
		-07		0.5-1.0': SAND, C-M, dark yellowish brown (10YR 4/4), dry. Loose. No odor.			0 ppm
				Some as above, yellowish brown (10YR 5/4).			
-2	2	-08		Some as above.			0 ppm
		-09		Some as above.		SP	0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1-103
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soit Boring
Dote(s): 08/12/09 - 08/12/09
Totol Depth: 5.00'
Remorks: Field Instrument: OCM MiniRAE #1
No refusol.

Dotum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Bock Fill:
type: Aspholt fm: 0.00' to: 0.50'
type: Notive Moteriol fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Driller: D. Levesque
Borehole Dia.: 2.00in

Elevation	Depth	Sample No.	Recovery	Moteriol Oescription	Grophic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-10		0.25-0.5': STONE, process.		K1	0 ppm
		-11		0.5-1.0':SAND, C-M; little C-F gravel; dork yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
-2	2	-12		Some os obove. SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
		-13		Some os obove.		SP	0 ppm
-4	4			End of boring ot 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KCV

Project Nome: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1-104
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Dote(s): 08/12/09 - 08/12/09
Totol Depth: 5.00'
Remorks: Field Instrument: OVM MiniRAE #1
No refusol.

Dotum:
Ground Elevotion: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Orilling Method: Geopropbe

Driller: D. Levesque
Borehole Dio.: 2.00in

Bock Fill:
type: Aspholt fm: 0.00' to: 0.50'
type: Notive Moteriol fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Moteriol Oescription	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-14		0.25-0.5': STONE, process.		K1	
				0.5-1.0': SAND, C-M, dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
		-15		Some as above, dark yellowish brown (10YR 3/4).			0 ppm
-2	2	-16		Some as above, yellowish brown (10YR 5/4).			0 ppm
		-17		Some as above, yellowish brown (10YR 5/4).		SP	0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KL ✓

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-105
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location: Former WC-09
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Aspholt fm: 0.00' to: 0.50'
type: Native Material fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-18		0.25-0.5': STONE, process.		K1	0 ppm
		-19		0.5-1.0': SAND, C-M; little C-F grovel; troce groyish white posty sand; dork yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
				SAND, C-M; little C-F grovel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			
-2	2	-20		SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
		-21		Some as above, yellowish brown (10YR 5/4).		SP	0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1-106
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Totol Depth: 5.00'
Remorks: Field Instrument: OVM MiniRAE #1
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Moteriol fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Moteriol Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-22		0.25-0.5': STONE, process.		K1	0 ppm
		-23		0.5-1.0': SAND, M; some C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
-2	2	-24		SAND, C-M; little C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
		-25		SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.		SP	0 ppm
-4	4			Some as above.			
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-107
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe

Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Native Material fm: 0.00' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		-26		0-0.25': Topsoil and roots. 0.25-1.0': SAND, M, dark brown (10YR 3/3), dry. Loose. No odor.		TS	0 ppm
		-27		SAND, M; some C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
-2	2	-28, -29		SAND, C-M; trace C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
		-30		SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.		SP	0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: RLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-108
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geoprobe
Driller: O. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Material fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-31		0.25-0.5': STONE, process.		K1	
				0.5-1.0': SAND, M, dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
		-32		SAND, C-M, dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
-2	2	-33		Same as above, yellowish brown (10YR 5/4).			0 ppm
		-34		Same as above, yellowish brown (10YR 5/4).		SP	0 ppm
-4	4			End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-109
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
145 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Dote(s): 08/12/09 - 08/12/09
Totol Depth: 5.00'
Remorks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevotion: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Bock Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Notive Moteriol fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-35		0.25-0.5': STONE, process.		K1	0 ppm
		-36		0.5-1.0': SAND, M; some C-F gravel; very dark grayish brown (10YR 3/2), dry. Loose. No odor.			0 ppm
				SAND, C-M; little C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			
-2	2	-37		SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
		-38				SP	
				Some as above, yellowish brown (10YR 5/4).			0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: JKL

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-110
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Material fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-39		0.25-0.5': STONE, process.		K1	0 ppm
		-40		0.5-1.0': SAND, M; little C-F gravel; very dark grayish brown (10YR 3/2), dry. Loose. No odor.			0 ppm
-2	2	-41		SAND, C-M; trace C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			
				Some as above, dark yellowish brown (10YR 3/4).			0 ppm
		-42				SP	
-4	4			SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-111
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Native Material fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-43		0.25-0.5': STONE, process.		K1	0 ppm
		-44, -45		0.5-1.0': SAND, M; little C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
				SAND, C-M; 1race C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			
-2	2	-46		Some as above, dark yellowish brown (10YR 3/4).			0 ppm
		-47				SP	
				SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
-4	4						
				End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-112
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Totol Depth: 5.00'
Remorks: Field Instrumenl: OVM MiniRAE #1
No refusol.

Datum:
Ground Elevotion: 0.00'
Coordinole X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dia.: 2.00in

Bock Fili:
type: Aspholt fm: 0.00' to: 0.50'
type: Notive Moterial fm: 0.50' lo: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-48		0.25-0.5': STONE, process.		K1	0 ppm
		-49		0.5-1.0': SAND, M; little C-F grovel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
-2	2	-50		SAND, C-M; troce C-F grovel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
		-51		Same os above, dark yellowish brown (10YR 3/4).		SP	0 ppm
-4	4			SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			
				End of boring ot 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLW

Project Nome: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-113
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Dote(s): 08/12/09 - 08/12/09
Totol Depth: 4.00'
Remorks: Field Instrument: OVM MiniRAE #1
No refusol.

Dotum:
Ground Elevotion: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Controctor: Fuss & O'Neill Borehole Dio.: 1.25in
Drilling Method: Hond Geopropbe

Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Notive Moteriol	fm: 0.50'	to: 4.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-60		0.25-0.5': STONE, process.		K1	0 ppm
		-61		0.5-1.0': SAND, M; little C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
-2	2	-62		SAND, C-M; trace C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.		SP	0 ppm
		-63		Same as above, dark yellowish brown (10YR 3/4).			0 ppm
-4	4			SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			
-6	6			End of boring at 4.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: AJW

Project Nome: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1-114
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Dote(s): 08/12/09 - 08/12/09
Totol Oepth: 4.00'
Remorks: Field Instrument: OVM MiniRARE #1
No refusol.

Dotum:
Ground Elevotion: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Hand Geopropbe
Driller: D. Levesque
Borehole Dio.: 1.25in

Bock Fill:
type: Asphalt fm: 0.00' to: 0.50'
type: Notive Moteriol fm: 0.50' to: 4.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevotion	Depth	Somple No.	Recovery	Moteriol Oescription	Grophic Log	USCS Code	OVM
0		N/A		0-0.25': ASPHALT.		AS	
		-64		0.25-0.5': STONE, process.		K1	0 ppm
		-65		0.5-1.0': SANO, M; little C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
-2	2	-66		SANO, C-M; troce C-F grovel; dork yellowish brown (10YR 3/4), dry. Loose. No odor.		SP	0 ppm
		-67		SANO, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.			0 ppm
-4	4			Some os obove.			
				End of boring ol 4.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLW

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-115
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe
Driller: D. Levesque
Borehole Dio.: 2.00in

Back Fill:
type: Aspholt fm: 0.00' to: 0.50'
type: Native Material fm: 0.50' to: 5.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Moteriol Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-52		0.25-0.5': STONE, process.		Kt	
		-53		0.5-1.0': SAND, M; little C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
				SAND, M; trace C-F gravel; dark yellowish brown (10YR 3/4), dry. Loose. No odor.			0 ppm
-2	2	-54		Same os above.			0 ppm
		-55		SAND, C-M; trace C-F grovel; yellowish brown (10YR 5/4), dry. Loose. No odor.		SP	0 ppm
-4	4			End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KL

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-116
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 08/12/09 - 08/12/09
Total Depth: 5.00'
Remarks: Field Instrument: OVM MiniRAE #1
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Geopropbe

Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 5.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	OVM
		N/A		0-0.25': ASPHALT.		AS	
		-56		0.25-0.5': STONE, process.		K1	0 ppm
		-57		0.5-1.0': SAND, M; little C-F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			0 ppm
				Some as above.			
-2	2	-58		Some as above.			0 ppm
		-59		SAND, C-M, yellowish brown (10YR 5/4), dry. Loose. No odor.		SP	0 ppm
-4	4			End of boring at 5.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: RLC

Project Name: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: **P1–105A**
Project Number: **2005–1184 R70**

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/05/09 – 10/05/09**
Total Depth: **7.00'**
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coordinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dia.: **2.00in**
Drilling Method: **Hollow Stem Auger**
Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 7.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		AS	
				0.5–3.0': SAND, M; some F gravel; little C sand; dark brown (10YR 3/3) to 1.5 feet, then dark yellowish brown (10YR 4/6), dry. Loose. No odor.			
–2	2			3.0–5.0': SAND, C–M; some F gravel; brown (10YR 4/3), dry. Loose. No odor.			
		–84					
–4	4					SP	
		–85		Same as above, light yellowish brown (10YR 6/4)..			
–6	6						
				End of boring at 7.0 feet.			
–8	8						
–10	10						
–12	12						
–14	14						
–16	16						
–18	18						

Checked By: KLV

Project Name: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: P1–117
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/02/09 – 10/02/09**
Total Depth: **6.00'**
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coordinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dia.: **2.00in**
Drilling Method: **Hand Geoprobe**
Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt and stone process.		AS	
		-35		0.25–2.0': SAND, M; little F gravel; strong brown (7.5YR 4/6), dry. Loose. No odor.		K1	
-2	2	-36		2.0–4.0': SAND, C–M; some F gravel; little F sand; brown (10YR 5/3), dry. Loose. No odor.			
						SP	
-4	4	-37		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: **P1–118**
Project Number: **2005–1184 R70**

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/02/09 – 10/02/09**
Totol Depth: **6.00'**
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coordinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dia.: **2.00in**
Drilling Method: **Hond Geoprobe**
Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt and stone process.		AS	
		-38		0.5–4.0': SAND, C–M; little F gravel and F sand; brown (7.5YR 4/3), dry. Loose. No odar.		K1	
-2	2	-39					
						SP	
-4	4	-40		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1-119
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Oate(s): 10/02/09 - 10/02/09
Totol Depth: 6.00'
Remorks: Field Instrument: None
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Hand Geoprobe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:

type: Aspholt	fm: 0.D0'	to: 0.50'
type: Notive Moterial	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0-0.5': Asphalt and stone process.		AS	
		-41, -42		0.5-2.0': SAND, M; little F gravel; strang brawn (7.5YR 4/6), dry. Loose. No odar.		K1	
				2.0-4.0': SAND, C-M; same F gravel; little F sand; brawn (7.5YR 4/3), dry. Loase. No odor.			
-2	2	-43					
						SP	
-4	4	-44		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1–120
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/02/09 – 10/02/09
Totol Depth: 6.00'
Remorks: Field Instrument: None
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Hand Geaprobe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Moteriol	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt ond stone process.		AS	
		-45		0.5–2.0': SAND, M–F; trace F gravel; dark brown (7.5YR 3/2), moist. Loose. Na odor.		K1	
-2	2	-46		2.0–4.0': SAND, C–M; little F gravel and F sand; brown (7.5YR 4/3), dry. Loose. No odor.			
						SP	
-4	4	-47		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–121
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/02/09 – 10/02/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: D. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe

Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt and stone process.		AS	
		-48		0.5–2.0': SAND, M; little F gravel; brown (7.5YR 4/4), dry. Loose. No odor.		K1	
-2	2	-49		2.0–4.0': SAND, C–M; some F gravel; little F sand; brown (7.5YR 5/3), dry. Loose. No odor.			
						SP	
-4	4	-50		Some as above.			
-6	6			End of baring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–122
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/02/09 – 10/02/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: D. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe

Back Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt and stone process.		AS	
		-51		0.5–2.0': SAND, M–F; little F gravel; dark brown (7.5YR 3/2), moist. Loose. No odor.		K1	
-2	2	-52		2.0–4.0': SAND, C–M; some F gravel; little F sand; brown (7.5YR 4/3), dry. Loose. No odor.			
						SP	
-4	4	-53		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–123
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/02/09 – 10/02/09
Totol Depth: 6.00'
Remarks: Field Instrument: None
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coardinate Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dio.: 2.00in
Drilling Methad: Hand Geoprobe
Bock Fill:

type: Asphalt	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	ta:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': Asphalt and stone pracess.		AS	
		-54		0.5–2.0': SAND, M; little F gravel; strong brown (7.5YR 4/6), dry. Loose. No odor.		K1	
-2	2	-55		2.0–4.0': SAND, M; little F gravel; brown (10YR 4/3), dry. Loose. No odor.			
-4	4	-56		SAND, C–M; some F gravel; little F sand; brown (7.5YR 4/3), dry. Loose. No odor.		SP	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P1–124
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 – 10/05/09
Totol Depth: 4.00'
Remorks: Field Instrument: None
No refusol.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Driller: D. Levesque
Borehole Dio.: 1.25in
Drilling Method: Concrete Corer/Shovel/Hond Geoprobe
Back Fill:
type: Concrete fm: 0.00' to: 0.40'
type: Native Moterial fm: 0.40' to: 4.00'
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Materiol Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.4': CONCRETE.		CR	
		–58		0.4–0.6': SAND, M; some F gravel; dark brown (7.5YR 3/3), dry. Loose. No odor. (Fill).		FI	
		N/A –59		0.6–0.7': CONCRETE.		CR	
				0.7–2.0': SAND, M; some F gravel; little C sand; brown (10YR 5/3), dry. Loose. No odor.			
–2	2	–60		Same as above, dark yellowish brown (10YR 4/4).		SP	
–4	4			End of boring at 4.0 feet.			
–6	6						
–8	8						
–10	10						
–12	12						
–14	14						
–16	16						
–18	18						

Checked By: [illegible]

Project Nome: **Wood Group / P&W**
Project Locotion: **Windsor Locks, Connecticut**

Site Id: P1–125
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Oate(s): 10/05/09 – 10/05/09
Totol Oepth: 6.00'
Remorks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Controctor: Fuss & O'Neill Borehole Oio.: 2.00in
Drilling Method: Hond Geoprobe
Bock Fill:

type: Concrete	fm: 0.00'	to: 0.40'
type: Native Material	fm: 0.40'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Materiol Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-61		0.5–4.0': SANO, M; some F gravel and C sand; brown (10YR 4/3) to 2.5 feet, then dark yellowish brown (10YR 4/6), dry. Loose. No odor.			
-2	2	-62					
						SP	
-4	4	-63		Same os obove, light yellowish brown (10YR 6/4).			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KL✓

Project Nome: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–126
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 – 10/05/09
Total Depth: 6.00'
Remorks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dia.: 2.00in
Drilling Method: Hond Geoprobe
Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-64, -65		0.5–4.0': SAND, M; little F gravel; and C sand; dark brown (10YR 3/3) to 2.0 feet, then brown (10YR 4/3), dry. Loose. No odor.			
-2	2	-66					
						SP	
-4	4	-67		SAND, M–F; little F gravel; light yellowish brown (10YR 6/4), dry. Loose. No odor.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: RLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–127
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 – 10/05/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: D. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe

Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	ta: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-68		0.5–1.5': SAND, M; little F gravel and C sand; dark brown (10YR 3/3), dry. Loose. No odor.			
-2	2	-69		1.5–4.0': SAND M; little F gravel and C sand; dark yellowish brown (10YR 4/6), dry. Loose. No odor.			
-4	4	-70		SAND, M; some C sand; little F gravel; light yellowish brown (10YR 6/4), dry. No odor.		SP	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-128
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 - 10/05/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: O. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe

Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0-0.5': CONCRETE.		CR	
		-71		0.5-2.0': SAND, M; little F gravel and C sand; dark brown (10YR 3/3). Loose. No odor.			
-2	2	-72		2.0-4.0': SAND, M; little F gravel and C sand; dark yellowish brown (10YR 4/6). Loose. No odor.			
						SP	
-4	4	-73		SAND, M; some C sand; little F gravel; light yellowish brown (10YR 6/4), dry. No odor.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W Project Location: Windsor Locks, Connecticut	Site Id: P1–129 Project Number: 2005–1184 R70	FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 – 10/05/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Hand Geoprobe
Driller: D. Levesque
Borehole Dia.: 2.00in

Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Moterial	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-74		0.5–2.0': SAND, M; little F gravel and C sand; dark brown (10YR 3/3) to 1.5 feet, then dark yellowish brown (10YR 4/6) to 2.0 feet, then light yellowish brown (10YR 6/4). Loose. No odor.			
-2	2	-75					
						SP	
-4	4	-76		Some as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: **P1–130**
Project Number: **2005–1184 R70**

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/05/09 – 10/05/09**
Total Depth: **6.00'**
Remarks: **Field Instrument: None**
No refusal.

Datum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coardinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dia.: **2.00in**
Drilling Method: **Hand Geoprobe**
Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-77		0.5–4.0': SAND, M; little F gravel and C sand; yellowish brown (10YR 5/4) to 2.0 feet, then brown (10YR 4/3), dry. Loose. No odor.			
-2	2	-78					
						SP	
-4	4	-79		SAND, C–M; some F gravel; brown (10YR 4/3), dry. Loose. No odor.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1–131
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 – 10/05/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: D. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe

Back Fill:

type: Concrete	fm: 0.00'	to: 0.50'
type: Native Material	fm: 0.50'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A		0–0.5': CONCRETE.		CR	
		-80, -81		0.5–4.0': SAND, M; little F gravel and C sand; brown (10YR 4/3), dry. Loose. No odor.			
-2	2	-82					
						SP	
-4	4	-83		SAND, C–M; some F gravel; light yellowish brown (10YR 6/4), dry. Loose. No odor.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P1-132
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/05/09 - 10/05/09
Total Depth: 3.00'
Remarks: Field Instrument: None

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dia.: 2.00in
Drilling Method: Hand Geoprobe
Bock Fill:

type: Asphalt	fm: 0.00'	to: 0.30'
type: Native Material	fm: 0.30'	to: 3.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		N/A -86		0-0.3': ASPHALT. 0.3-2.0': SAND, C-M; some F gravel; brown (10YR 4/3), dry. Loose. No odar.		AS	
-2	2	-87		Same as above.		SP	
				Refusal and end of boring at 3.0 feet.			
-4	4						
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: JKLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P3-101A
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/01/09 – 10/01/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coardinate Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dia.: 3.00in
Drilling Method: Shovel/Hond Auger/Hand Geoprobe
Back Fill:
type: Native Material fm: 0.00' to: 6.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-01		SAND, M; some roots; little F gravel; very dark brown (7.5YR 2.5/2), dry. Loose. No odor.		SP	
-2	2	-02		SAND, F-M; some silt; little F gravel; brown (7.5YR 4/4), dry. Loose. No odor.			
-4	4	-03		Same as above, moist.		SM	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLW

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P3-102A
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/01/09 - 10/01/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dia.: 3.00in
Drilling Method: Shovel/Hond Auger/Hand Geoprobe
Back Fill:
type: Native Material fm: 0.00' to: 6.00'
type: fm: ta:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-14		SAND, M; little C-F gravel; very dark grayish brown (10YR 3/2), dry. Loose. No odor.			
-2	2	-15		2.0-3.5': Same as above. 3.5-4.0': Sand and silt; trace clay and organics; black (10YR 2/1), moist. Slightly compact. No odor.		SP	
-4	4	-16		Sand, F and silt; little clay and C sand; trace organics; black (10YR 2/1), moist. Slightly compact with some elasticity. No odor.		SM/ML	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: **P3-104**
Project Number: **2005-1184 R70**

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/01/09 - 10/01/09**
Total Depth: **6.00'**
Remorks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coordinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dio.: **3.00in**
Drilling Method: **Shovel/Hand Auger/Hand Geoprobe**
Back Fill:

type: Native Material	fm: 0.00'	to: 6.00'
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:
type:	fm:	to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-04, -05		SAND, M; some roots; little F gravel; dark brown (7.5YR 3/2), dry. Loose. No odor.			
-2	2	-06		SAND, C-M; some C-F grovel; brown (7.5YR 4/4), dry. Loose. No odor.		SP	
-4	4	-07		Same as above, moist.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: RLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P3-105
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/01/09 - 10/01/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Driller: O. Levesque
Contractor: Fuss & O'Neill
Borehole Dia.: 3.00in
Drilling Method: Shovel/Hand Auger/Hand Geoprobe
Back Fill:
type: Native Material fm: 0.00' ta: 6.00'
type: fm: ta:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-08		SAND, M; some roots; little F gravel; dark brown (7.5YR 3/2), dry. Loose. No odor.			
-2	2	-09		SAND, M-F; trace F gravel; yellowish brown (10YR 5/8). dry. Loose. No odor.		SP	
-4	4	-10		SAND, F, light yellowish brown (10YR 6/4), dry. Loose. No odor.		SW	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W Project Location: Windsor Locks, Connecticut	Site Id: P3-106 Project Number: 2005-1184 R70	FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:	Datum:	Logged By: M. Wujcik	Driller: D. Levesque
Description: Soil Boring	Ground Elevation: 0.00'	Contractor: Fuss & O'Neill	Borehole Dia.: 3.00in
Date(s): 10/01/09 - 10/01/09	Coordinate X: 0.00	Drilling Method: Shovel/Hand Auger/Hand Geoprobe	
Total Depth: 6.00'	Coordinate Y: 0.00	Back Fill:	
Remarks: Field Instrument: None No refusal.		type: Native Material	fm: 0.00' to: 6.00'
		type:	fm: to:
		type:	fm: to:
		type:	fm: to:
		type:	fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-11		SAND, M; some roots; little F gravel; dark brown (7.5YR 3/2), dry. Loose. No odor.			
-2	2	-12		SAND, brown (7.5YR 4/4), dry. Loose. No odor.		SP	
-4	4	-13		SAND, C-M, brown (7.5YR 4/4), moist to wet at 5.5 feet. Loose. No odor.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Nome: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P3–107
Project Number: 2005–1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Date(s): 10/01/09 – 10/01/09
Total Depth: 6.00'
Remorks: Field Instrument: None
No refusol.

Datum:
Ground Elevatian: 0.00'
Coordinote X: 0.00
Coardinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Shovel/Hand Auger/Hond Geoprobe
Bock Fill:
type: Native Moteriol fm: 0.00' to: 6.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Driller: D. Levesque
Borehole Dio.: 3.00in

Elevation	Depth	Sample No.	Recovery	Moteriol Description	Graphic Log	USCS Code	Vapor
0		-17		SAND, M; little C–F gravel; trace roots; very dark grayish brown (10YR 3/2), dry. Loose. No odor.			
-2	2	-18		Same as above.		SP	
-4	4	-19		4.0–5.0': Same as above, dark brown (7.5YR 3/2). 5.0–6.0': Sand, F and silt; little clay and C sand; trace organics; very dark grayish brown (10YR 3/2), moist. Slightly compact. No odor.		SM/ML	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W Project Locotion: Windsor Locks, Connecticut	Site Id: P3–108 Project Number: 2005–1184 R70	FUSS & O'NEILL *Disciplines to Deliver* 146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Soil Boring
Date(s): 10/01/09 – 10/01/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Caordinote Y: 0.00

Logged By: M. Wujcik Driller: D. Levesque
Contractor: Fuss & O'Neill Borehole Dia.: 3.00in
Drilling Method: Shovel/Hand Auger/Hand Geoprobe
Back Fill:
type: Native Moterial fm: 0.00' to: 6.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-20		SAND, M; little C–F gravel; dark brown (10YR 3/3), dry to moist at 1.0 foot. Loose. No odor.			
-2	2	-21		SAND, C–F, very dark grayish brown (10YR 3/2), wet at 2.0 feet. Loose. No odor.		SP	
-4	4	-22		Same as above.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: **Wood Group / P&W**
Project Location: **Windsor Locks, Connecticut**

Site Id: **P3–109**
Project Number: **2005–1184 R70**

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: **Soil Boring**
Date(s): **10/01/09 – 10/01/09**
Total Depth: **6.00'**
Remarks: Field Instrument: None
No refusal.

Dotum:
Ground Elevation: **0.00'**
Coordinate X: **0.00**
Coordinate Y: **0.00**

Logged By: **M. Wujcik** Driller: **D. Levesque**
Contractor: **Fuss & O'Neill** Borehole Dia.: **3.00in**
Drilling Method: **Shovel/Hand Auger/Hand Geoprobe**
Back Fill:
type: Native Material fm: 0.00' to: 6.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-23		SAND, C–M; little F gravel; dark brown (10YR 3/3), dry. Loose. No odor.			
-2	2	-24		Some as above, dark yellowish brown (10YR 4/4), wet at 2.0 feet.		SP	
-4	4	-25		Sand, F and silt; dark grayish brown (10YR 4/2), moist. Slightly compact. No odor.		SM	
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Location: Windsor Locks, Connecticut

Site Id: P3-110
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Location:
Description: Sail Boring
Date(s): 10/01/09 – 10/01/09
Total Depth: 6.00'
Remarks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinate X: 0.00
Coordinate Y: 0.00

Logged By: M. Wujcik
Contractor: Fuss & O'Neill
Drilling Method: Shovel/Hand Auger/Hond Geoprobe
Back Fill:
type: Native Moterial fm: 0.00' to: 6.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Driller: D. Levesque
Borehole Dia.: 3.00in

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-26, -27		SAND, C-M; little F gravel; brown (1DYR 4/3), dry. Loose. No odor.			
-2	2	-28		Same as above, moist to wet at 3.0 feet.		SP	
-4	4	-29		Same as above, wet.			
-6	6			End of boring at 6.0 feet.			
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: KLV

Project Name: Wood Group / P&W
Project Locotion: Windsor Locks, Connecticut

Site Id: P3-111
Project Number: 2005-1184 R70

FUSS & O'NEILL
Disciplines to Deliver
146 HARTFORD ROAD, MANCHESTER, CONNECTICUT 06040

Locotion:
Description: Soil Boring
Dote(s): 10/01/09 - 10/01/09
Totol Depth: 4.00'
Remorks: Field Instrument: None
No refusal.

Datum:
Ground Elevation: 0.00'
Coordinote X: 0.00
Coordinote Y: 0.00

Logged By: M. Wujcik
Controctor: Fuss & O'Neill
Drilling Method: Shovel/Hand Auger/Hond Geoprobe
Bock Fill:
type: Native Material fm: 0.00' to: 4.00'
type: fm: to:
type: fm: to:
type: fm: to:
type: fm: to:

Driller: D. Levesque
Borehole Dio.: 3.00in

Elevation	Depth	Sample No.	Recovery	Material Description	Graphic Log	USCS Code	Vapor
0		-30		SAND, C-M; little F gravel; very dark grayish brown (10YR 3/2), moist. Loose. No odor.		SP	
		N/A		GRAVEL, C.		GW	
-2	2	-31		SAND, F; little C-M sond; very dark gray (10YR 3/1), wet. Loose. No odor.		SP	
-4	4			End of boring at 4.0 feet.			
-6	6						
-8	8						
-10	10						
-12	12						
-14	14						
-16	16						
-18	18						

Checked By: RLW

FUSS & O'NEILL

Appendix B

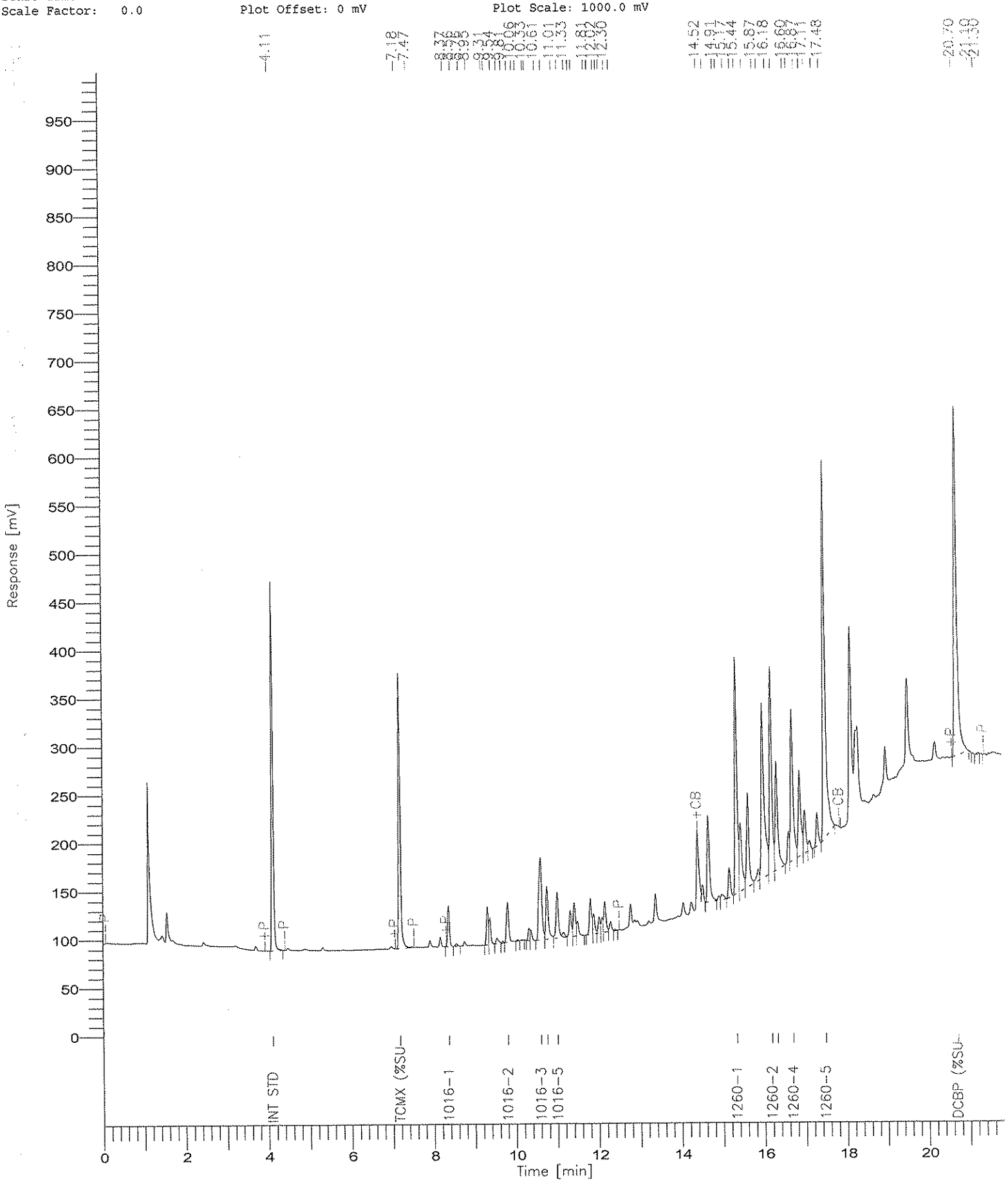
Chromatograms for PCBs in Groundwater

Chromatogram

Aroclor 1016 & 1260 STD
3ug/L

Sample Name : MIX 600
FileName : E:\TC2009\ECD5\AUG2009\813A025.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 01:04 PM
Time of Injection: 8/13/09 05:18 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

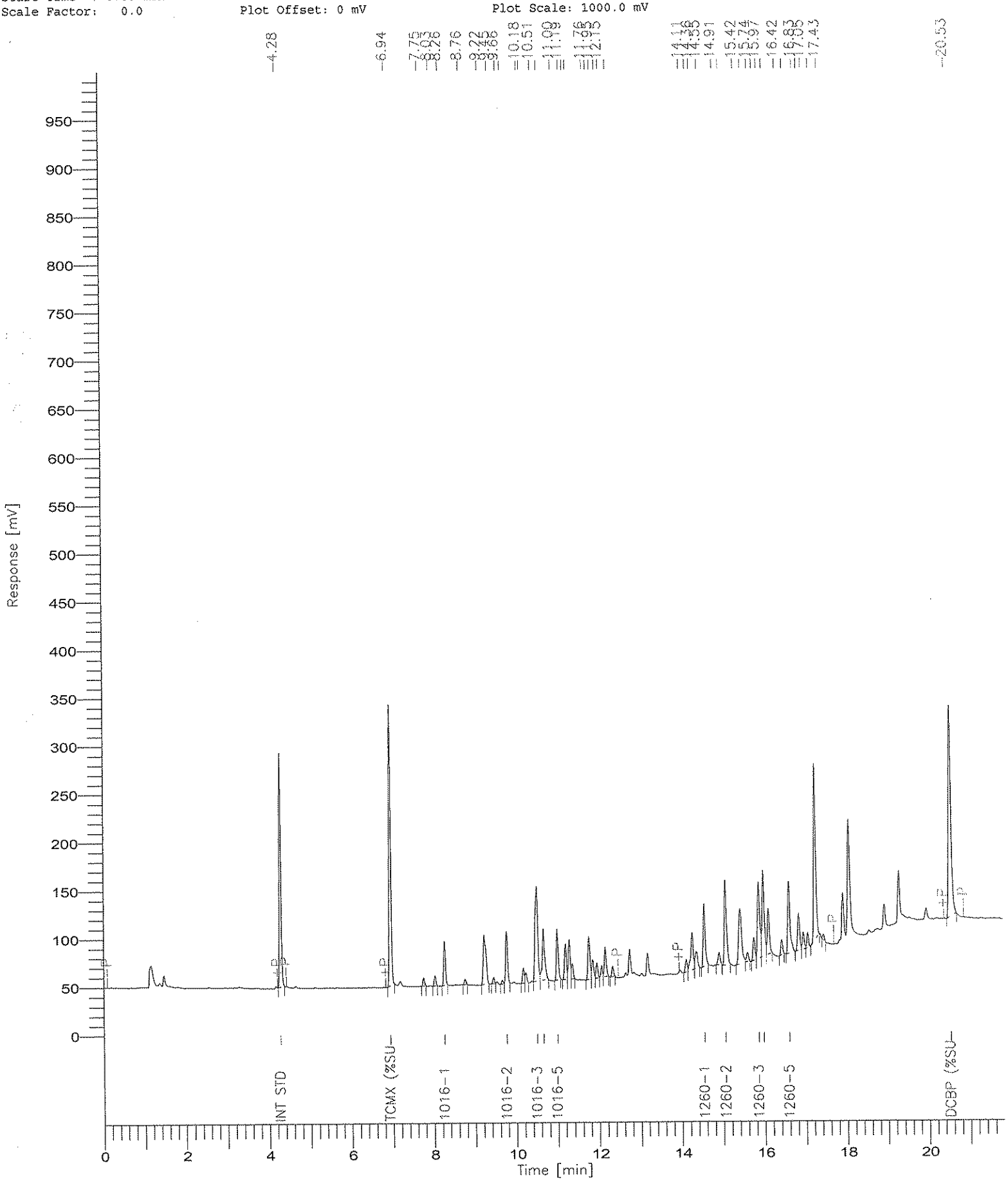


Chromatogram

Aroclor 1016 & 1260 STD
3ug/L

Sample Name : MIX 600
FileName : E:\TC2009\ECD5\AUG2009\813B025.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:49 PM
Time of Injection: 8/13/09 05:18 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

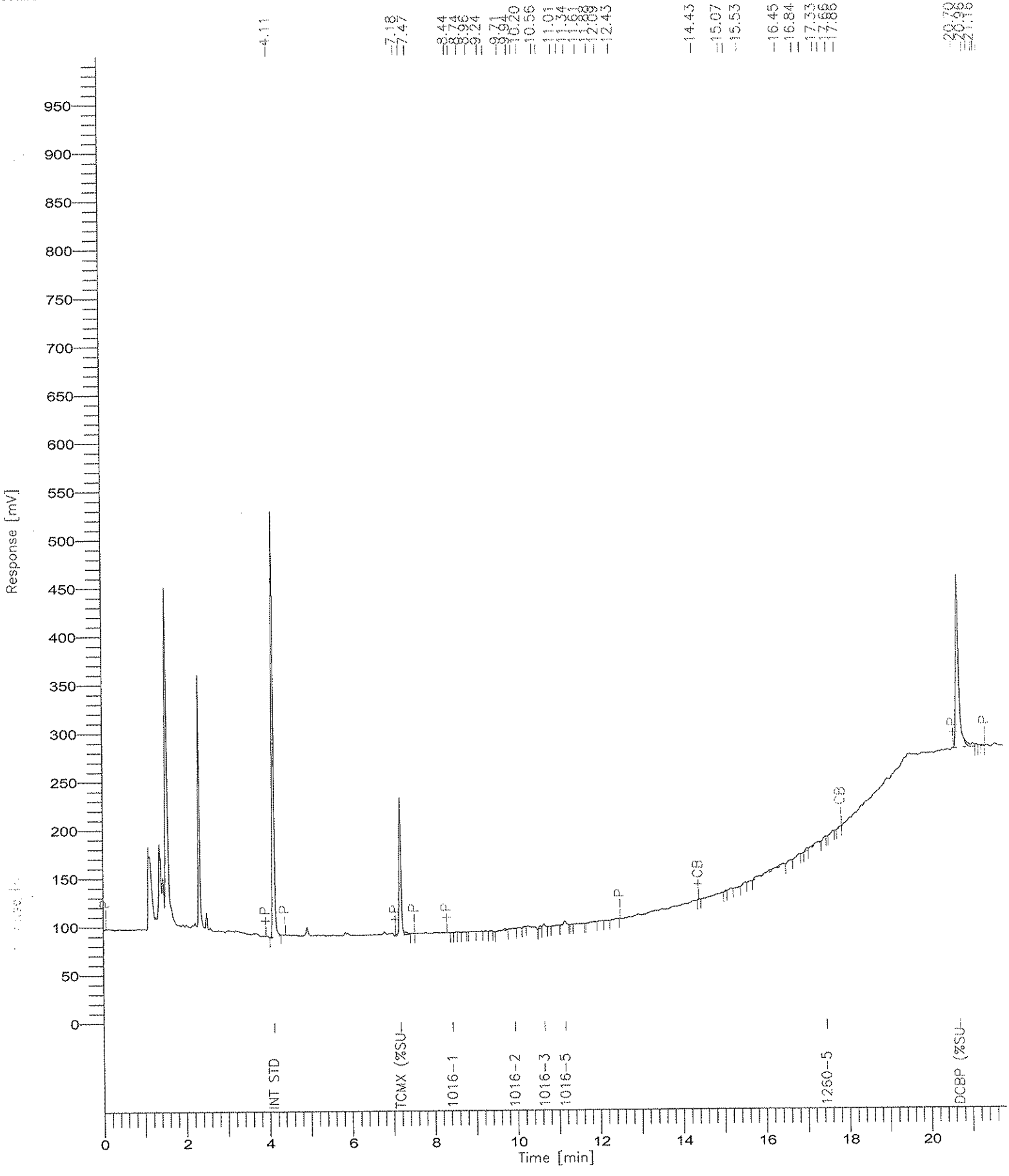


Chromatogram

BLANK

Sample Name : BLK 8/12 W
FileName : E:\TC2009\ECD5\AUG2009\813A026.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 01:04 PM
Time of Injection: 8/13/09 05:44 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

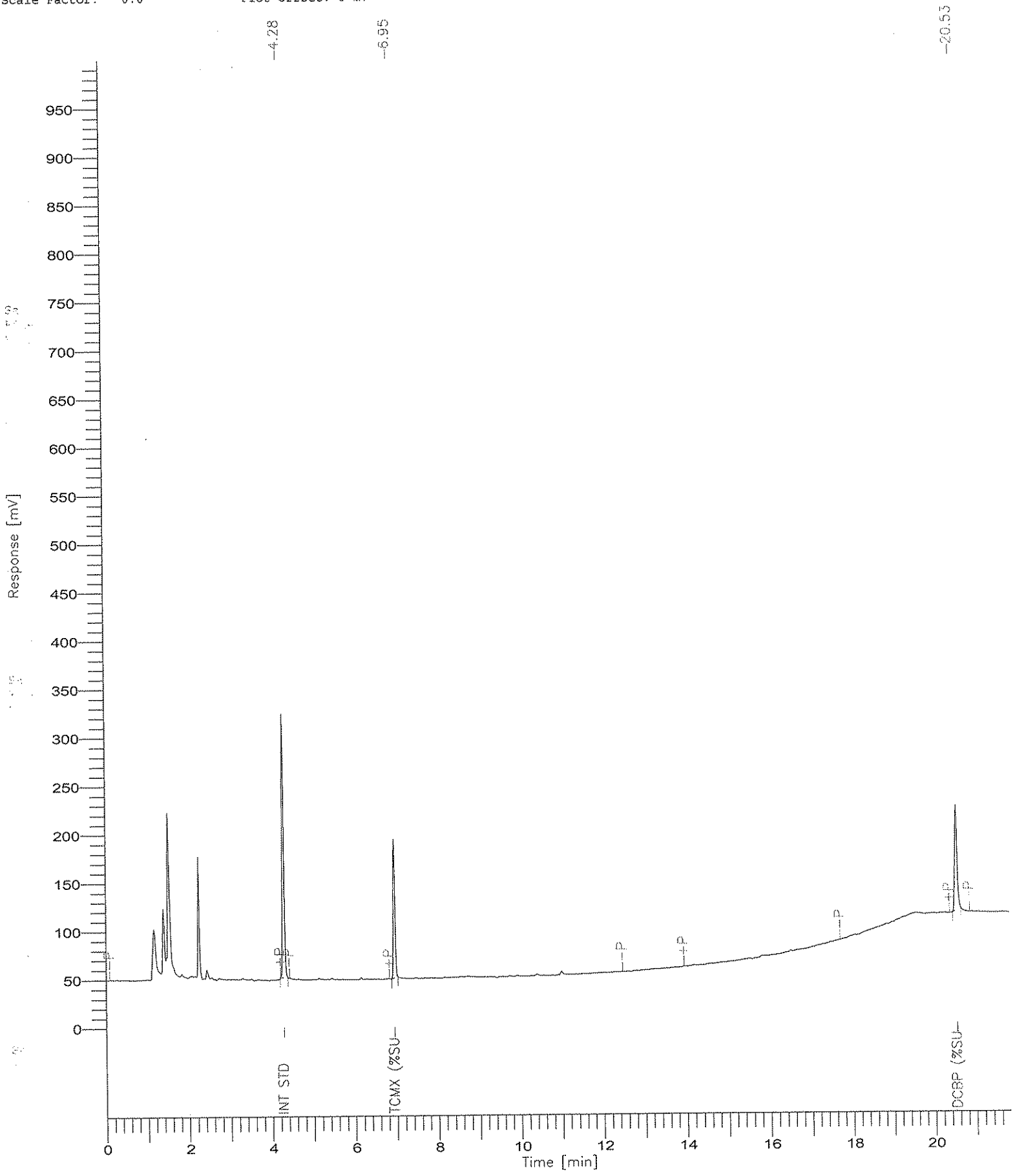


Chromatogram

BLANK

Sample Name : BLK 8/12 W
FileName : E:\TC2009\ECD5\AUG2009\813B026.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:49 PM
Time of Injection: 8/13/09 05:44 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

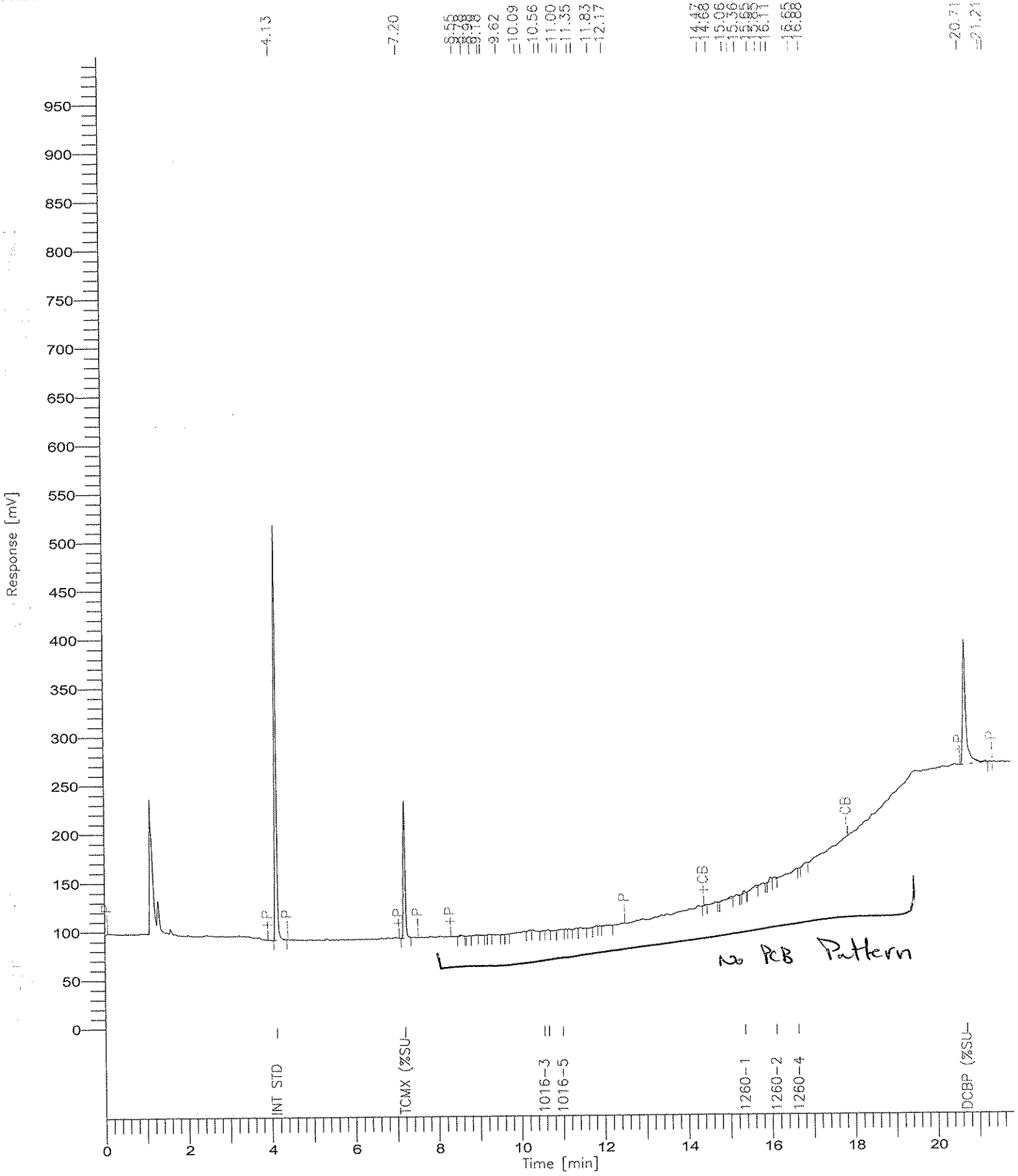


Chromatogram

790090812-01

Sample Name : 12713 W
FileName : E:\TC2009\ECD5\AUG2009\813A031.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1
Date : 1/20/10 01:05 PM
Time of Injection: 8/13/09 07:54 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

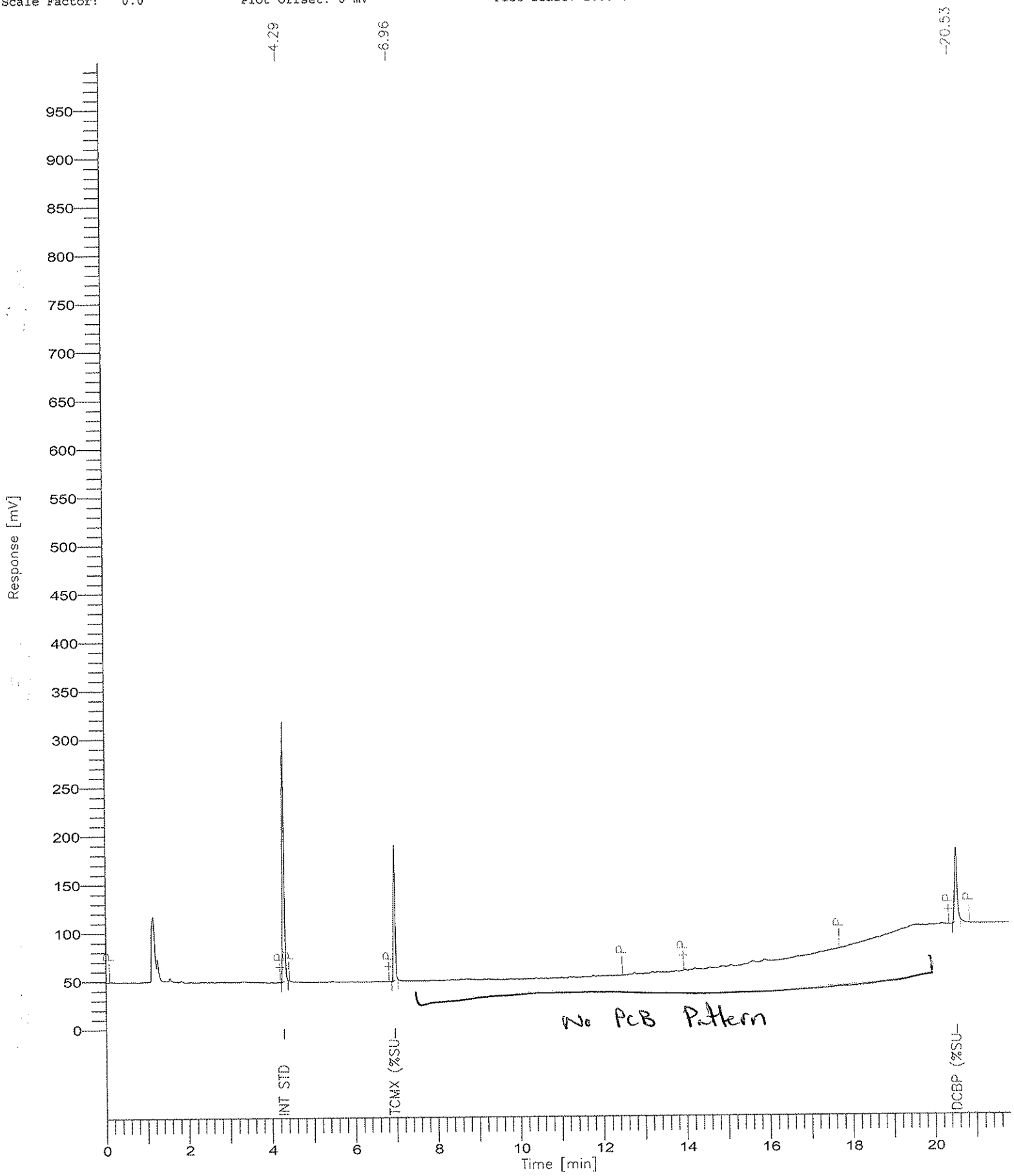


Chromatogram

790090812-01

Sample Name : 12713 W
FileName : B:\TC2009\ECD5\AUG2009\813B031.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:48 PM
Time of Injection: 8/13/09 07:54 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

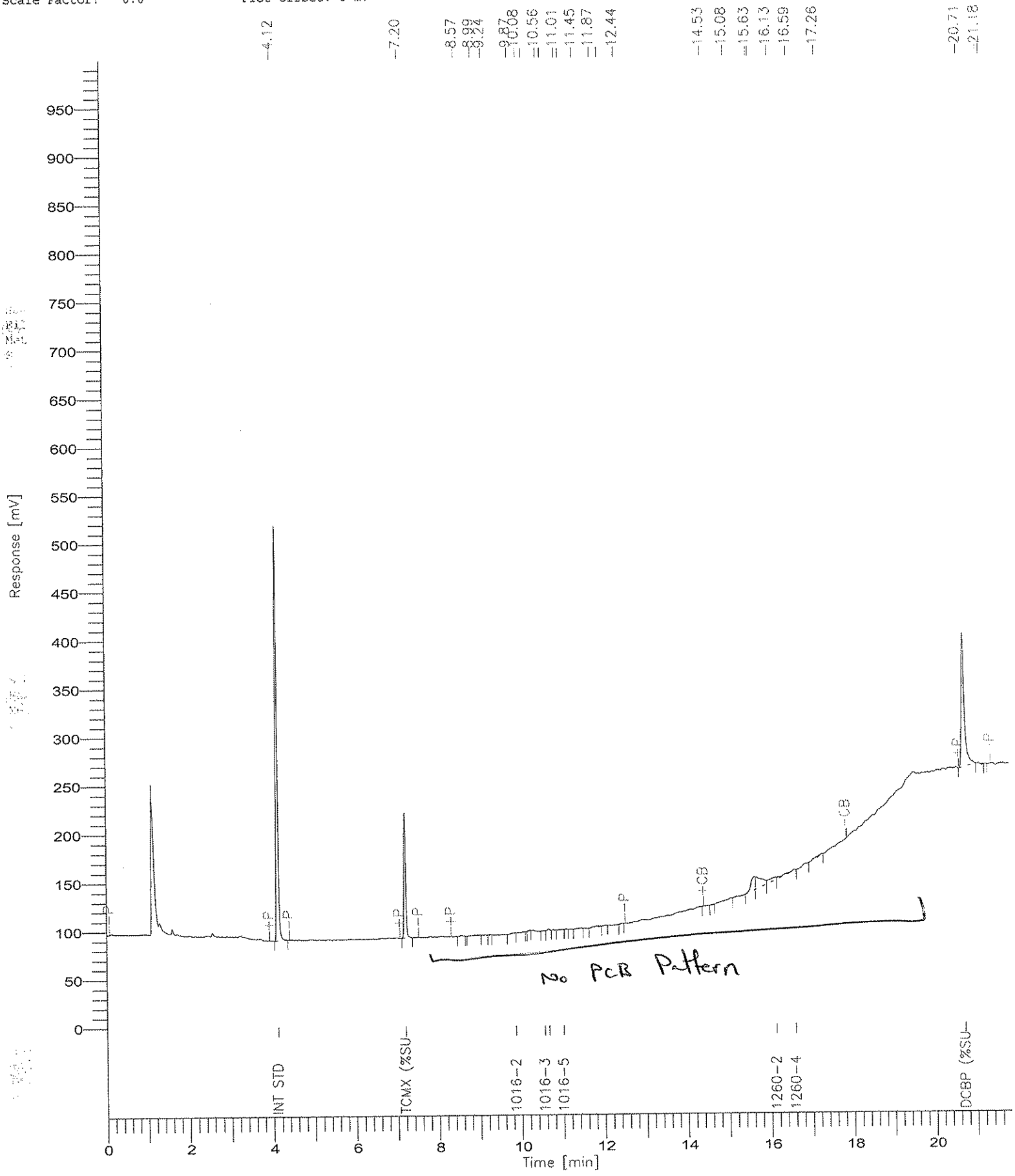


Chromatogram

790090812-02

Sample Name : 12714 W
FileName : E:\TC2009\ECD5\AUG2009\813A032.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 01:05 PM
Time of Injection: 8/13/09 08:20 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

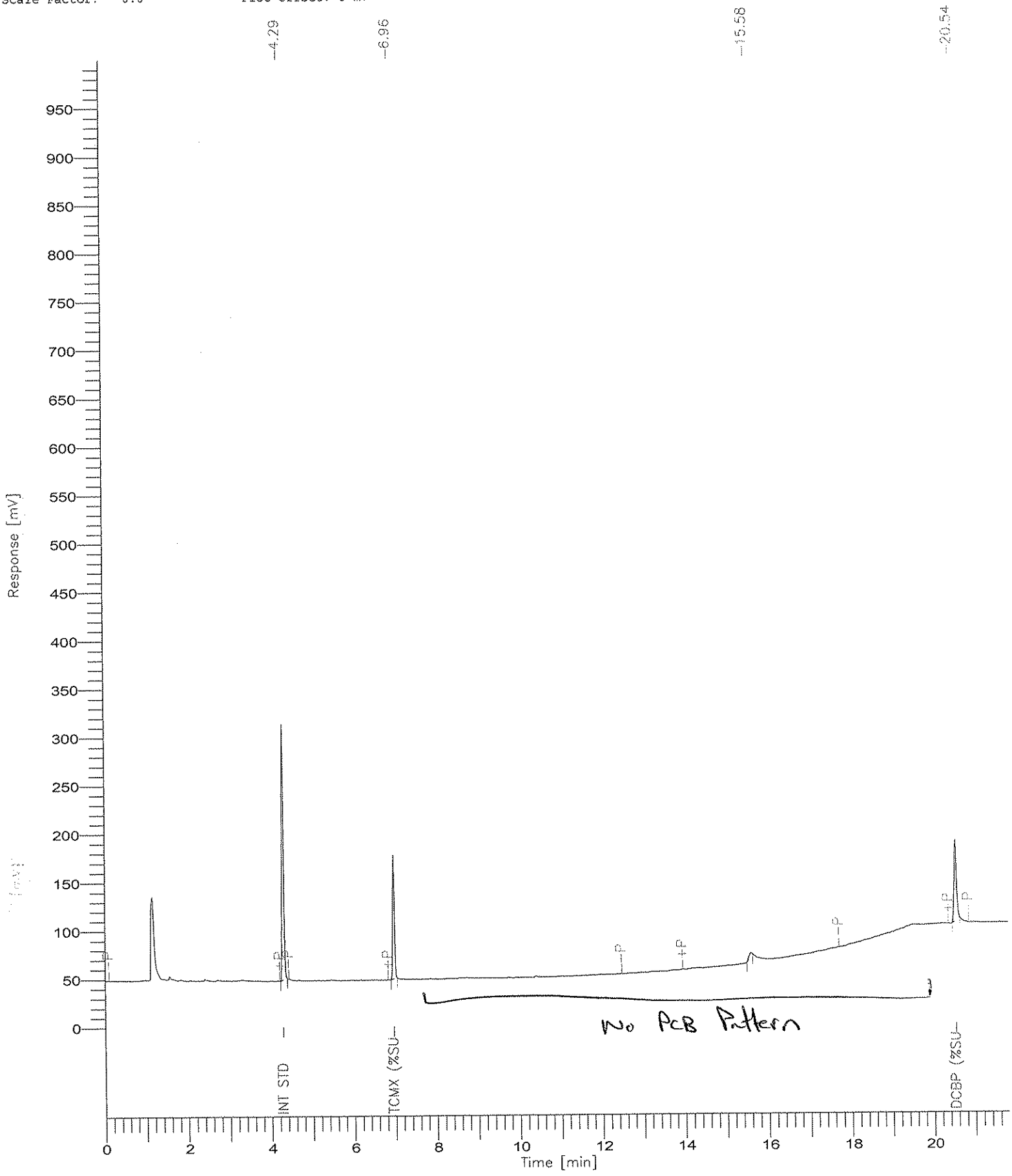


Chromatogram

790090812-02

Sample Name : 12714 W
FileName : E:\TC2009\ECD5\AUG2009\813B032.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:48 PM
Time of Injection: 8/13/09 08:20 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV



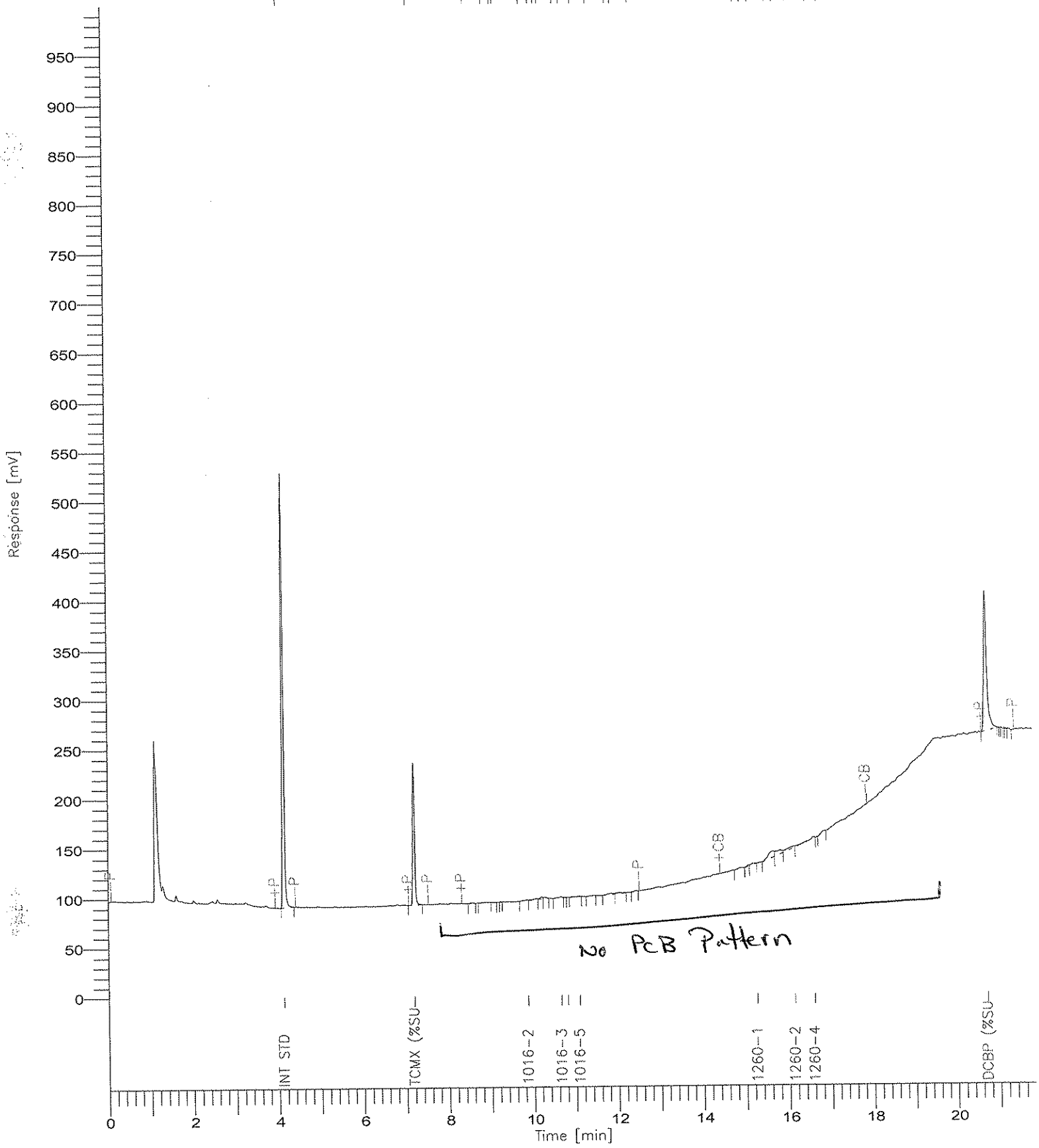
Chromatogram

790090812-03

Sample Name : 12715 W
FileName : E:\TC2009\ECD5\AUG2009\813A033.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1
Date : 1/20/10 01:05 PM
Time of Injection: 8/13/09 08:46 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

4.12 7.20 8.54 8.98 9.17 9.86 10.08 10.30 10.66 11.09 11.45 11.91 12.45 14.91 15.26 15.65 16.13 16.59 16.87 20.71 21.04 21.24

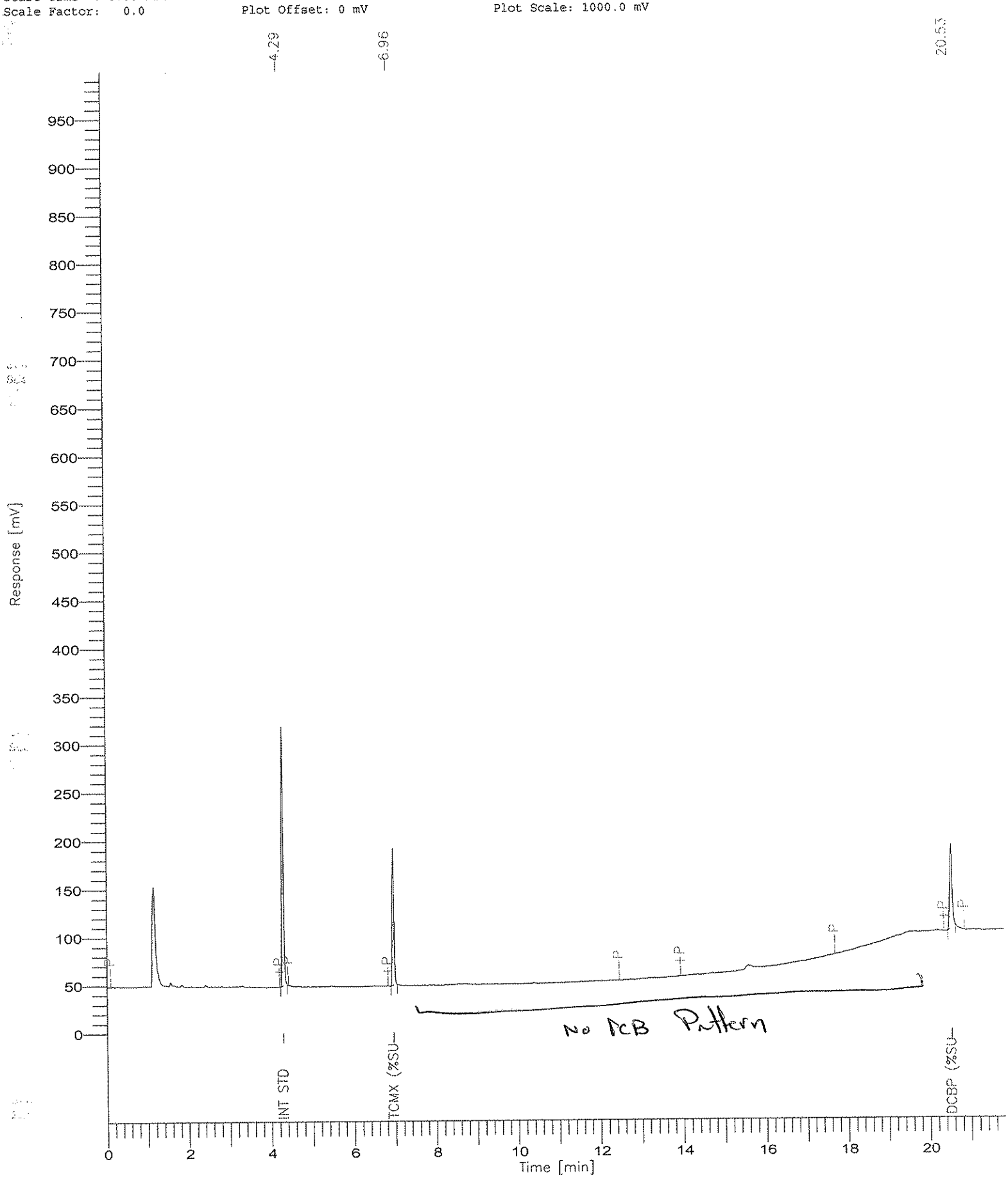


Chromatogram

790090812-03

Sample Name : 12715 W
FileName : E:\TC2009\ECD5\AUG2009\813B033.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:48 PM
Time of Injection: 8/13/09 08:46 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

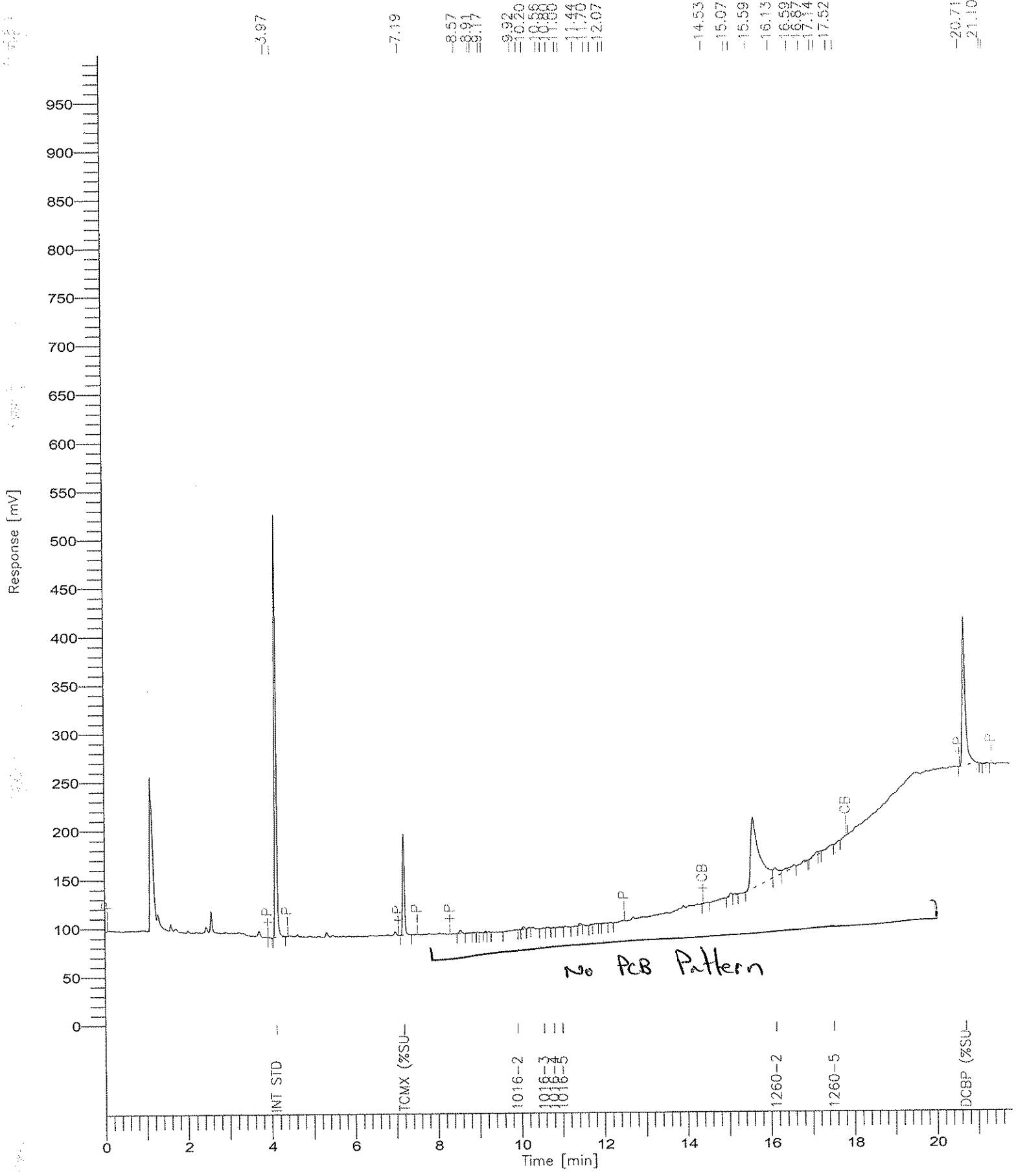


Chromatogram

79090812-04

Sample Name : 12716 W
FileName : E:\TC2009\ECD5\AUG2009\813A034.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1
Date : 1/20/10 01:05 PM
Time of Injection: 8/13/09 09:12 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

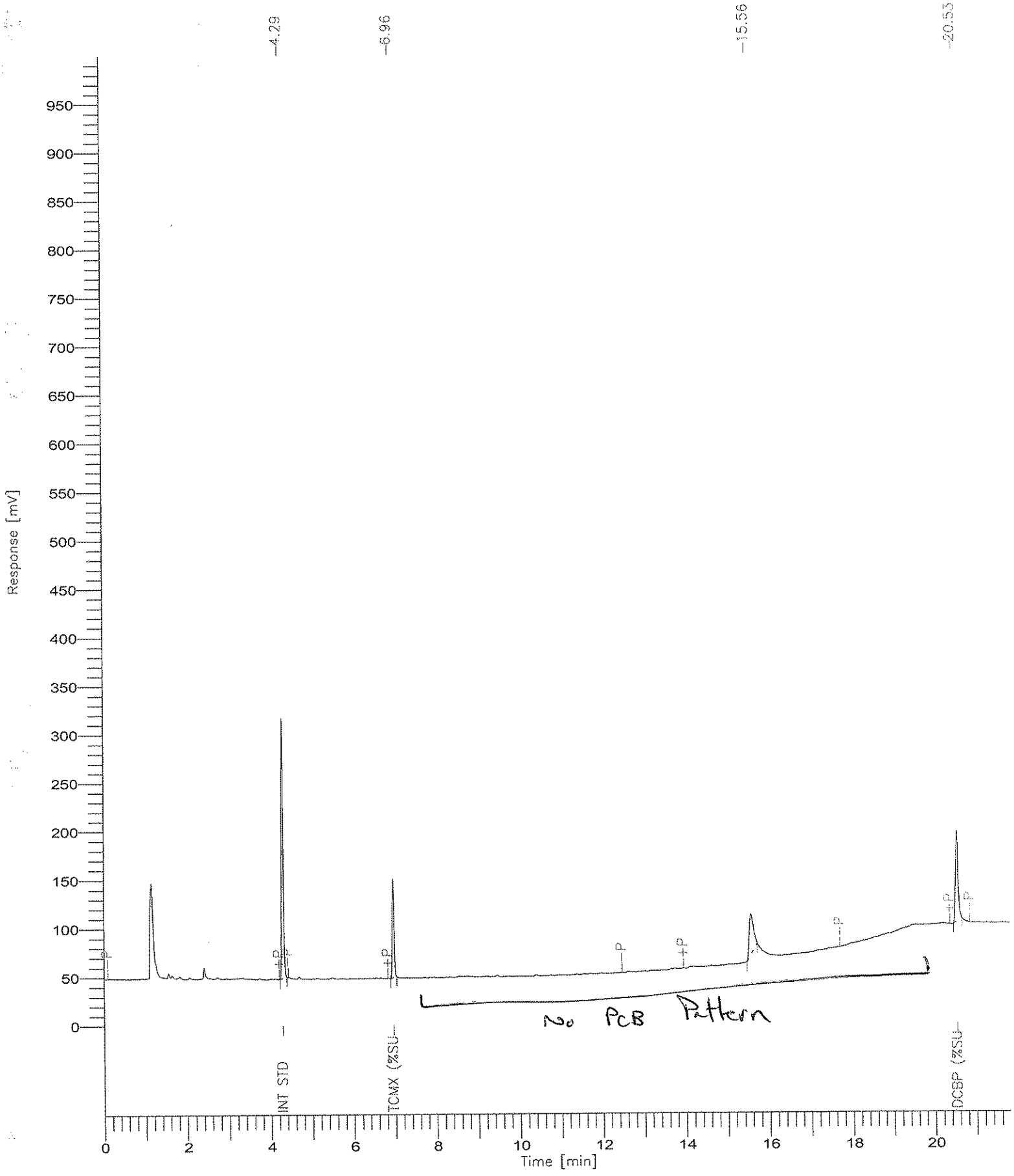


Chromatogram

790090812-04

Sample Name : 12716 W
FileName : E:\TC2009\ECD5\AUG2009\813B034.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 12:48 PM
Time of Injection: 8/13/09 09:12 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

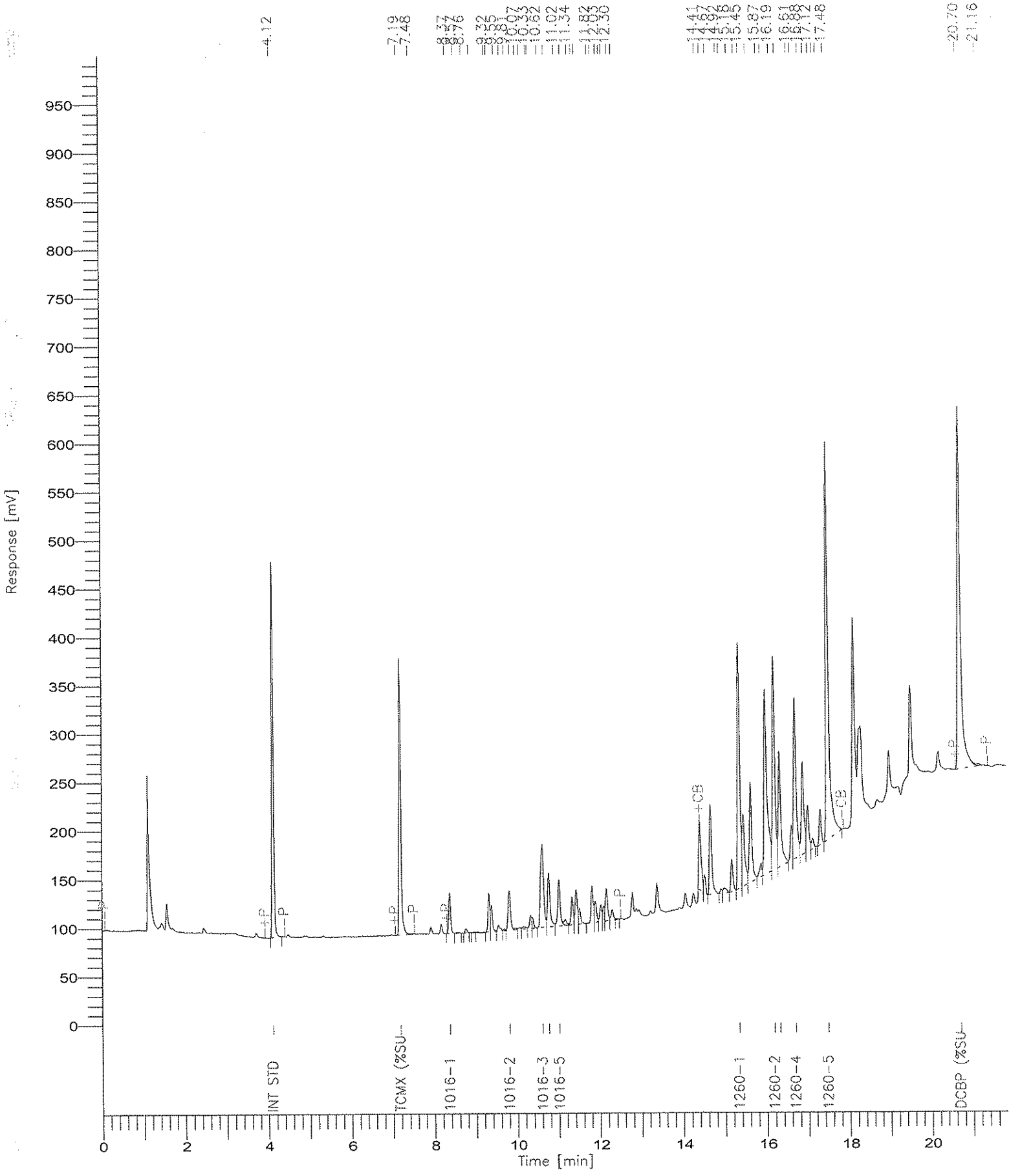


Chromatogram

Aroclor 1016 & 1260 STD
3ug/L

Sample Name : MIX 600
FileName : E:\TC2009\ECD5\AUG2009\813A037.RAW
Method : PCBMX2A.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1 Page 1 of 1
Date : 1/20/10 01:05 PM
Time of Injection: 8/13/09 10:30 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV

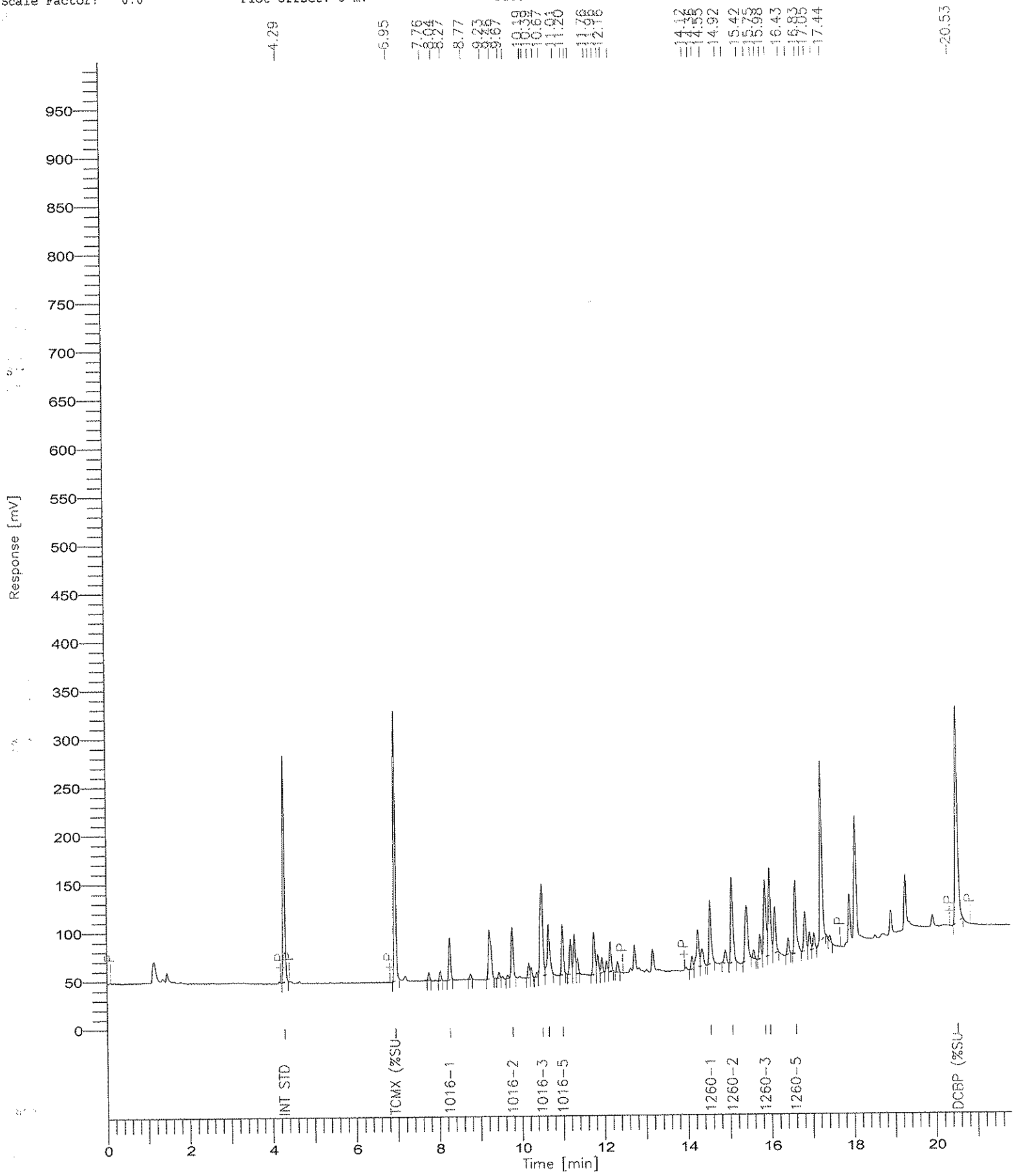


Chromatogram

Aroclor 1016 & 1260 STD
3ug/L

Sample Name : MIX 600
FileName : E:\TC2009\ECD5\AUG2009\813B037.RAW
Method : PCBMX2B.MTH
Start Time : 0.00 min End Time : 21.79 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 1
Date : 1/20/10 12:48 PM
Time of Injection: 8/13/09 10:30 PM
Low Point : 0.00 mV High Point : 1000.00 mV
Plot Scale: 1000.0 mV



FUSS & O'NEILL

Appendix C

Laboratory Standard Operating Procedures

PHOENIX
Environmental Laboratories, Inc.

Date: 7/27/09
Version: 4
Initiated by: K. Cressia
Approved by: Michael Hahn
Keith Abrom

SOP Number: 622.8082

Title: PCB Analysis by GC Method 8082A

1.0 Scope and Application

1.1 Method 8082A is used to determine the concentration of polychlorinated biphenyls (PCBs) as Aroclors in extracts from solid and aqueous matrices. The analysis is performed by Gas Chromatography with an electron capture detector.

1.2 The estimated quantitation limit for most compounds is 0.5 ppb for a 1-Liter volume of water or 80ug/Kg based on a 15g-soil amount.

1.3 The following procedure covers the determination of these Aroclors: Ar-1016, Ar-1221, Ar-1232, Ar-1242, Ar-1248, Ar-1254, Ar-1260, Ar-1262, and Ar-1268.

2.0 Summary of Method

2.1 The PCBs are extracted from soil and water with known amounts of methylene chloride. The extract is then exchanged with hexane and brought to a final volume of 5mL. If a LDL (low detection limit) is desired, the final volume is 1mL.

2.2 The extract is injected into the GC-ECD via direct splitless injection into a fused silica capillary column. The GC is temperature programmed to separate the Aroclor patterns over time, which are then detected by the ECD.

2.3 The samples are quantitated based on a fingerprint pattern associated with each Aroclor. In addition, the retention times for the peaks within the pattern are matched with that of a known standard.

3.0 Interferences

3.1 Contaminated solvents, reagents or sample processing hardware.
3.2 Contaminated parts, column surfaces and detector surfaces.
3.3 Compounds extracted from the sample that will cause detector response.
3.4 Phthalate esters found mostly in plastics.
3.5 Elemental sulfur.

4.0 Sample Collection, Preservation and Storage

4.1 Collect 1 liter of unpresevered sample in an amber glass container with a Teflon-lined cap.
4.2 Samples must be kept at 4°C until time of extraction.
4.3 Samples must be extracted within 7 days from time of collection.
4.4 Sample extracts must be stored at 4°C in the dark and analyzed within 40 days of extraction.

5.0 Equipment and Supplies

5.1 Instrument Hardware

5.1.1 Perkin Elmer Autosystem Gas Chromatography with ECD.

5.2 Column

5.2.1 PCBs: RTX-CLPesticides 1: 30 m x 0.53 mm ID x 0.5 µm film thickness (Restek # 11140).

5.2.2 Pesticides/PCBs-Dual-column: RTX-CLPesticides 1: Fused silica; 30m x 0.53mm ID x 0.5µm film thickness (Restek # 11140). RTX-CLPesticides 2 : Fused silica; 30m x 0.53mm ID x 0.2µm film thickness (Restek # 11340).

5.3 Gas- Ultra high purity liquid nitrogen.

6.0 Reagents and Standards

6.1 Hexane – Pesticide/PCB quality

6.2 Calibration Standards
6.2.1 Aroclor 1016/1260 at 1000ug/mL in Isooctane (Ultra # PPM-8082)
6.2.2 Aroclor 1221 at 100ug/mL in Isooctane (Ultra # PP-292)
6.2.3 Aroclor 1232 at 100ug/mL in Isooctane (Ultra # PP-302)
6.2.4 Aroclor 1242 at 100ug/mL in Isooctane (Ultra # PP-312)
6.2.5 Aroclor 1248 at 100ug/mL in Isooctane (Ultra # PP-342)
6.2.6 Aroclor 1254 at 100ug/mL in Isooctane (Ultra # PP-352)
6.2.7 Aroclor 1262 at 100ug/mL in Isooctane (Ultra # PP-371)
6.2.8 Aroclor 1268 at 100µg/mL in Isooctane (Ultra # PP-382)
6.2.9 Pesticide Surrogate Standard Spiking Solution at 200ug/mL in acetone (Ultra # ISM-320)

6.3 Calibration Verification Standard (CVS)
6.3.1 Aroclor 1016 at 1000µg/mL in Isooctane (Supelco # 4-8097)
6.3.2 Aroclor 1260 at 1000µg/mL in Isooctane (Supelco # 4-4809)

NOTE: Stock standard solutions must be replaced before the expiration date.

6.4 Calibration and Standard Curve

6.4.1 External calibration procedure- Prepare calibration standards for Aroclors 1016 and 1260 as outlined below in Pesticide/PCB quality hexane.

µL 1016/1260	µL Surrogate	1016/1260 Conc. (ppb)	Surrogate Conc.(ppb)	Final Vol.(mL)
1	1	100	20	10
6	3	600	60	10
8	4	800	80	10
10	5	1000	100	10
12	6	1200	120	10

6.4.2 Prepare 1000 ppb Standards for the remaining Aroclors.

µL Aroclor	µL Surrogate	Aroclor Conc. (ppb)	Surrogate Conc.(ppb)	Final Vol.(mL)
100	5	1000	100	10

6.5 Working Calibration Verification Standard

6.5.1 Prepare a calibration verification standard (CVS) of Aroclors 1016 and 1260 at 1000 ppb as outlined below in PCB/Pesticide quality hexane.

µL each Aroclor	µL Surrogate	Aroclor Conc. (ppb)	Surrogate Conc.(ppb)	Final Vol.(mL)
10	5	1000	100	10

7.0 Definitions

7.1 Calibration Standard (CAL)- A solution of procedure analytes used to calibrate the mass spectrometer response.

7.2 Calibration Verification Standard (CVS)- A solution of procedure analytes, from a separate source than the Calibration Standard, used to verify the Calibration Standard.

7.3 Laboratory Control Sample (LCS)- A sample containing known

concentrations of analytes that is added prior to sample preparation and then analyzed by the laboratory to demonstrate that it can obtain acceptable identifications and measurements.

7.4 Surrogate Compound- A compound that is not expected to be found in the sample that is added to a sample aliquot before extraction and is measured with the same procedures used to measure sample components. The purpose of a surrogate compound is to monitor procedure performance with each sample.

7.5 Method Blank- An aliquot of DI water or solid reference material that is treated as a sample. It is exposed to all glassware and apparatus, and all procedure solvents, reagents and surrogate compounds. The extract is concentrated to the final volume used for samples and is analyzed the same as a sample extract. The method blank is used to determine if method analytes are present in the lab environment, glassware or reagents.

8.0 Procedure

8.1 Gas Chromatograph Conditions

8.1.1 Injector Temperature: 250 degrees C

8.1.2 Detector Temperature: 380 degrees C

8.1.3 Carrier Gas: UHP Nitrogen at 5.8psi.

8.1.4 Temperature Program: PCBs
160 °C for 1 minute
Ramp 10 °C/min. to 260°C
Hold for 2 minutes
Total run time = 13 minutes.

8.1.5 Temperature Program: Pesticides/PCBs
150 °C for 1 minute
Ramp 8 °C/min. to 265°C
Hold for 6.6 minutes
Total run time = 22 minutes.

8.2 Initial Calibration

8.2.1 A five level calibration curve must be performed prior to the analysis of any samples. Identify each surrogate peak and five representative peaks for each aroclor. Calibrate the instrument. The RSD for Ar-1016 and Ar-1260 curves must be below 20%. The other remaining Aroclors are calibrated using one standard

level, identifying five peaks representative of that aroclor. The assumption can be made if the RSD is below 20% for mix Ar-1016/1260, a one-point calibration for the remaining Aroclors may be used for calibration and quantitation.

8.3 Calibration Verification

8.3.1 A 1000 ppb Mix 1016/1260 standard made from a source external to that of the calibration standards is analyzed following instrument calibration. The sole purpose of this standard is to validate the concentration of the calibration standards, therefore it is only analysed when a new calibration is performed. The percent recovery must not exceed +/-10%. If the standard fails to meet these criteria, a fresh standard should be made and analyzed. If the standard passes, analysis may continue. If the standard fails again, new calibration standards should be made and a new calibration performed.[11]

8.4 Continuing Calibration

8.4.1 A continuing calibration standard should be injected every ten samples and must be analyzed at least every twelve hours. An 800 ppb and a 1000 ppb Mix 1016/1260 standard are alternately used for this purpose, followed by an Ar-1254 calibration check standard to verify change in ECD response. All samples must be bracketed between check standards. The percent recovery for the calibration check standard must not exceed +/-15%. If the recovery fails to meet these criteria, a fresh standard should be made and analyzed. If the recovery meets the +/-15% criteria, analysis may continue. If the recovery fails again, a new calibration must be performed and data preceding the failed standard may not be reported. If the check standard recovery is greater than 15%, samples that are non-detects may be reported.

8.5 Method Blank

8.5.1 A method blank for each batch of extractions is to be run along with the samples. A method blank must be extracted daily for each type of extraction and at least every 20 samples. Analyte recovery should not exceed the reporting limit for that analyte.

8.6 Matrix Spike / Matrix Spike Duplicate

8.6.1 One MS/MSD per matrix must be analyzed every 20 samples. Recoveries should fall between the laboratory control limits established quarterly. Spiked samples do not require re-analysis if

matrix interferences are visibly present. Spike levels are at 400 ppb.

8.7 Laboratory Control Sample (LCS)

8.7.1 One LCS per matrix is to be run every 20 samples. Recoveries should fall between the laboratory control limits established quarterly. LCS spike level is at 400 ppb.

8.8 Sample Preparation

8.8.1 The sample extract for soils and waters will have a final volume of 5mL in hexane (if LDL analysis is desired, final volume will be 1mL). If the extract is to be analyzed for PCBs only, add 3 to 5 mL of concentrated sulfuric acid. If the extract is to be analyzed additionally for pesticides, split the extract and acidify one split. Concentrated sulfuric acid is used to remove matrix interferences such as elemental sulfur and phthalate esters. If concentrated sulfuric acid is added to the extracts, it must be added to associated QC samples as well.

8.8.2 Other sample clean-ups may need to be performed to remove interferences. They are as follows:

8.8.2.1 For samples that contain a high baseline and for all oil matrices, the sample is passed through a florisil cleanup. Using a pre-cleaned glass pipette, add a small piece of glass wool to the bottom and fill the pipette with florisil about 2/3 of the way up. Slowly add 2 to 3mL of extract to the pipette and allow the sample to pass through the florisil and collect in a 2mL vial. Label the vial with an "F" after the sample # on the vial to designate the sample is a florisil cleanup. In addition, put an "F" after the sample # in the instrument sequence. Any QC attached to this sample must also go through the clean-up procedure.

8.8.2.3 For samples that contain large amounts of sulfur, a copper cleanup must be performed. The copper must be activated in order to make it extremely reactive. This is accomplished by placing the copper powder into a pre-cleaned glass funnel containing a piece of filter paper. The oxides are then removed from the copper by treating it with dilute nitric acid, approximately five percent. Rinse the copper with organic free DI H_2O, making sure that all traces of the acid are removed. Perform a final rinse with acetone to remove the water. Remove the filter paper from the funnel and allow the acetone to evaporate. Place an

aliquot of the hexane layer of the sulfuric treated sample and place into a 4 ml glass vial and add 2-5 grams of the treated copper. Shake vigorously for approximately one minute and allow the layers to separate and reanalyze. Label the vial with an "S" after the sample # on the vial to designate the sample is a sulfur cleanup. In addition, put an "S" after the sample # in the instrument sequence. Any QC attached to this sample must also go through the clean-up procedure.

8.8.3 A 10x dilution is made for soils (unless LDL code is desired, then they are analyzed straight). Waters are analyzed straight.

9.0 Calculations

9.1 Samples are calculated by average response factor over a 5-point curve for Ar-1016/1260 and 1 point for the remaining Aroclors. Samples are matched to the Aroclor that has a similar fingerprint pattern. Sample concentrations that are above the calibration curve must be diluted to the middle of the calibration curve with hexane.

9.2 From the Turbochrome report, determine the concentration of the individual compounds in the sample from the raw amount using the calculations below.

9.3 Final Concentration in ppb (µg/Kg):

$$\frac{\text{ppb from TC} * \text{Final Volume (mL)} * \text{Dilution Factor} * 100}{\text{Initial Weight (g)} * \% \text{ solids}}$$

9.4 Final Concentration in ppb (µg/L):

$$\frac{\text{ppb from TC} * \text{Final Volume (mL)} * \text{Dilution Factor} * 100}{\text{Initial Volume (mL)}}$$

10.0 Quality Control

10.1 All standards are labeled, where applicable, with date received, date opened, analyst initials, expiration date, analyte name, analyte concentration and lot number.

10.2 An initial demonstration of capability must be performed to prove the generation of acceptable data with regard to accuracy and precision. An initial demonstration must be done for each new analyst, whether in the prep or instrument departments.

10.3 A continuing demonstration of capability or accuracy and precision study must be performed annually. Four standards at a level approximately ten times higher than the detection limit are evaluated for accuracy (% recovery) and precision (standard deviation). The RSD must be <20%.

10.4 A Method Detection Limit is performed annually. At least seven blanks are spiked with Ar-1016, Ar-1254 and Ar-1260 at a level of 2-5 times the expected detection limit. The standard deviation of the seven or more analyses is multiplied by the degrees of freedom to obtain the calculated method detection limit. Refer to 40 CFR Part 136 Appendix B.

10.5 Prep Blanks- Before processing any samples, the analyst must demonstrate that all glassware and reagent interferences are under control. Each time a batch of samples is extracted, a prep blank must be analyzed. If within the retention time window of any analyte of interest the LRB produces a peak that would prevent the determination of that analyte, determine the source of contamination and eliminate the interference before processing samples.

10.6 Matrix Spike and Matix Spike Duplicate- Two fortified environmental samples (labeled MS and MSD) are analyzed every batch of 20 samples. Thus 10% of all samples are represented by a fortified sample. Calculate the percent recovery for each analyte by dividing the result by the true value. The recovery must be between 30-130% recovery for MS/MSD. If the recovery of any such analyte falls outside the control limits and the LCS for that analyte is shown to be in control, the recovery problem encountered with the MS/MSD is judged to be matrix related, not system related. The result for that analyte in the unfortified sample is labeled suspect/matrix to inform the data user that the results are suspect due to matrix effects.

10.7 Laboratory Control Sample and Laboratory Control Duplicate- Two fortified blank samples (labeled LCS and LCSD) are analyzed every batch of 20 samples. Calculate the percent recovery for each analyte by dividing the result by the true value. The recovery must be between 40-130% recovery for LCS/LCSD. If the recovery of any such analyte falls outside the control limits, the batch needs to be repreped.

10.8 Surrogate Recoveries

10.8.1 When surrogate recovery from a sample or prep blank is <30%, it must be reprepped. If a surrogate recovery is >130%, it must be narrated.

10.8.2 If sample extract reanalysis meets the surrogate recovery criterion, report only data for the reanalyzed extract. If sample extract reanalysis continues to fail the surrogate recovery criterion, report all data for that sample as suspect.

11.0 Safety

11.1 The toxicity and carcinogenicity of each reagent used in this method have not been fully established. Each chemical should be regarded as a potential health hazard and exposure to these compounds should be as low as reasonably achievable. A reference file of material data handling sheets are available to all personnel involved in the chemical analysis.

11.2 Refer to Phoenix SOP #805: Hazardous Chemical and Laboratory Safety Procedures

12.0 Pollution Prevention

12.1 Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation.

12.2 Reagents and standards should be purchased and/or prepared in volumes consistent with laboratory use to minimize the volume of disposal.

13.0 Waste Management

13.1 It is the laboratories responsibility to comply with all Federal, State and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions, and to protect the air, water and land by minimizing and controlling all releases from fume hoods and bench operations. Compliance with all sewage discharge permits and regulations is also required.

14.0 Method Performance

14.1 This method was validated through internal QA/QC monitoring, including annual method detection limit studies, precision and accuracy studies, initial and continuing calibration verifications, blank analysis, laboratory control samples and matrix spikes and duplicates.

14.2 See Section 10.0 Quality Control in this SOP for acceptable limits.

15.0 Corrective Action for Out-of-Control or Unacceptable Data

15.1 See Section 10.0 Quality Control in this SOP for corrective actions.

16.0 Reference

16.1 EPA Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update IV, 2/07, Method 8082A.

FUSS & O'NEILL

Appendix D

Fuss & O'Neill Standard Operating Procedures

FIELD NOTEBOOKS

All field personnel will carry a bound field notebook. All field activities will be documented in the field notebook, regardless of whether or not those activities involve sample collection. Each employee's book will be numbered sequentially with the format of the employee number followed by the book number (i.e. **156-01**) and will be labeled on the cover as such with the range of dates covered by the book (i.e. 10/23/03 to 8/17/04). Each page of the field notebook book will be numbered with the employee number, the book number, and the page number (i.e. **156-01-01, 156-01-02, 156-01-03**, etc.). The field notebook will document site-specific information such as:

- Project name and location
- Names of other Fuss & O'Neill personnel involved in field activities
- Time and date of arrival at the site
- Weather conditions
- Sampling locations and corresponding sample numbers
- Documentation of field calibration of instruments
- Conversations with individuals on site
- Any unusual events or observations
- All information not recorded on field data sheets
- Time of departure from the site

For field investigations that involve the collection of samples, additional forms of documentation are required. See SOPs 020100, 020200, 020300, 020400, 020500, and 020600.

INTRODUCTION

All samples collected must have unique identifiers (Sample IDs). Since sampling locations may be sampled many times (e.g., quarterly monitoring programs), there must be a means of distinguishing samples from each other, whether from one sampling event or multiple events.

Fuss & O'Neill has adopted a protocol for assigning sample identification numbers. It is necessary to follow this protocol to ensure that:

- Sample locations are blind to the laboratory
- Analytical requests can be easily communicated with the laboratory
- Analytical data provided by the laboratory can be assigned to the correct sample location for reporting purposes

The only time sample IDs are to deviate from this protocol is when the client has specified an alternative sample numbering scheme.

SAMPLE IDENTIFICATION NUMBER

Each sampling location will be assigned a number by which samples can be identified. An example of a sample identification number is as follows:

XXXYYMMDD-## (e.g., 156050608-01)

This 11-digit code contains three types of information about the collection of the sample.

XXX	The employee number of the individual who collected the sample or supervised the sampling event
YY	Sample year
MM	Sample month
DD	Sample day
##	Assigned chronologically. Generally, the first sample collected during a sampling event is -01 and the numbers increase until the sampling event is completed. If the event continues over several days, the numbering sequence continues without returning to -01.

For sampling events that will involve the collection of over 100 samples, it is important to use a three-digit identifier (e.g., 156050608-001).

When multiple sample containers are filled from one sample location, all such samples are assigned the same sample identification number. Common situations where this will happen include, but are not limited to:

- Multiple containers required for various analytical parameters

- Split samples that are being submitted to different laboratories
- Sampling events that require sampling at the same location over two or more days dues to insufficient sample volume available (e.g., low yield monitoring wells)

An exception to this rule is duplicate samples which should be assigned unique sample identification numbers to keep the duplicates blind to the laboratory.

INTRODUCTION

All samples must be labeled in order to provide pertinent information to everyone who will be handling the sample. It is imperative that labels be applied to each sample container to ensure that all samples get transferred together.

SAMPLE LABELS

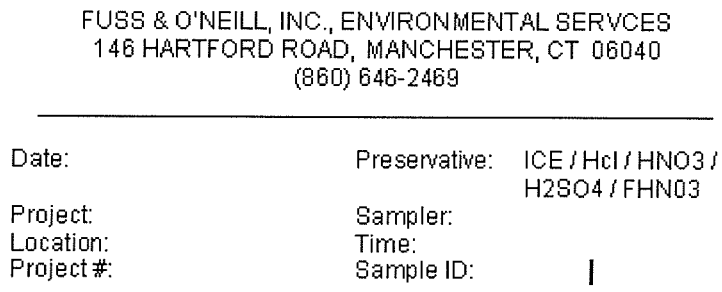
A sample label will be affixed to each sample container at the time of collection. Labels must be completed legibly with waterproof ink to prevent obliteration of the label. An example of a sample label is provided on Figure 020200.

The following information will be recorded on each label with waterproof ink:

- Sample identification number
- Project name
- Project location
- Project number
- Date of sample collection
- Time of sample collection
- Name/Initials of sampler
- Type of preservation

Labels are created using *Microsoft Word*, File, New…, Field Services Tab, Labels_Bottles.dot.

Figure 020200


FUSS & O'NEILL, INC., ENVIRONMENTAL SERVCES
146 HARTFORD ROAD, MANCHESTER, CT 06040
(860) 646-2469

Date:
Preservative: ICE / Hcl / HNO3 / H2SO4 / FHN03
Project:
Sampler:
Location:
Time:
Project #:
Sample ID:

INTRODUCTION

Many different types of environmental samples may be collected. These include, but are not limited to: groundwater, surface water, soil, sediment, concrete chips, wipes, indoor air, soil gas, and test pits. While some of the necessary documentation will be standard regardless of the type of sample (e.g., sample ID, date, time, sampler identification), each type also has information that is unique.

FIELD DATA SHEETS

Field data sheets have been developed for most types of samples encountered during field activities so that pertinent information is recorded at the time of sampling. Field personnel will thoroughly complete a field data sheet for each sample collected at the time of sampling.

At the conclusion of each sampling event, the field data sheets will be given to the project manager for review. This review should be conducted as soon as possible to ensure that, if edits are required, they can be done efficiently.

Examples of each of the existing field data sheets are provided as attachments to this Standard Operating Procedure.

Equipment Blank Field Data

Client/Project Name: Project Location:	**PROJECT #:**	FUSS & O'NEILL *Disciplines to Deliver*
Sample#:	Well ID **Equip Blank**	

Sample Data	Container	Quantity	Preservative
Date:_____ Time:_____ Sampler:_____ Weather:_____			
Blank Water Supplied By: Lab / F&O / Other _____ Equipment Used: Bailer / Filter / Pump / Other _____ Filtered in Field? No / @ Vehicle Method of Filtration: Pressure / Vacuum / Syringe Pump ID #: [ ] Filter: Disposable / Other _____ Appearance: Comments:			

* - Organic-free DI water used in these containers.

Comments:

Soil Sampling Field Data

Client/Project Name: Project Location: Date: Weather:	**PROJECT #:**	FUSS & O'NEILL *Disciplines to Deliver*

Sample #: Sample Location:	Container	Quantity	Preservative
Sampler: __Time:_____ Sampling Device: Auger / Geoprobe / Core Sampler / Shovel / Split Spoon / Scoop/ Other ___ Field decon: Yes / No / Dedicated Type of Sample: Grab / Composite / Other _____ Generic Soil Description:_____ Sample Depth: _____ PetroFLAG / OVM_____			

Sample #: Sample Location:	Container	Quantity	Preservative
Sampler: __Time: _____ Sampling Device: Auger / Geoprobe / Core Sampler / Shovel / Split Spoon / Scoop/ Other ___ Field decon: Yes / No / Dedicated Type of Sample: Grab / Composite / Other _____ Generic Soil Description:_____ Sample Depth: _____ PetroFLAG / OVM_____			

Sample #: Sample Location:	Container	Quantity	Preservative
Sampler: __Time:_____ Sampling Device: Auger / Geoprobe / Core Sampler / Shovel / Split Spoon / Scoop/ Other ___ Field decon: Yes / No / Dedicated Type of Sample: Grab / Composite / Other _____ Generic Soil Description:_____ Sample Depth: _____ PetroFLAG / OVM_____			

Sample #: Sample Location:	Container	Quantity	Preservative
Sampler: _____Time:_____ Sampling Device: Auger / Geoprobe / Core Sampler / Shovel / Split Spoon / Scoop/ Other ___ Field decon: Yes / No / Dedicated Type of Sample: Grab / Composite / Other _____ Generic Soil Description:_____ Sample Depth: _____ PetroFLAG / OVM_____			

FUSS & O'NEILL
Disciplines to Deliver

BORING LOG

PROJECT:

LOCATION:

SITE ID:
SHEET: of
PROJECT NO:
WEATHER:

CONTRACTOR:
OPERATOR:
F&O REPRESENTATIVE:
DRILLING METHOD:
SAMPLING METHOD:
HAMMER WT: HAMMER FALL (IN)
BORING LOCATION:
GROUND ELEVATION:
DATE STARTED:
SAMPLE PREFIX:

WATER LEVEL MEASUREMENTS

DATE	MS. PT.	WATER AT	TIME

TIME AND DATE OF COMPLETION:

DEPTH (FT)	SAMPLE No. AND TIME	SAMPLE DEPTH (FT)	SAMPLE JARS/ PRE-SERVATIVE	REC/ PEN	BLOWS 6"	SAMPLE DESCRIPTION	STRATA CHANGE	LITHO-LOGIC CODE	FIELD TESTING

BORING DIAMETER	BORING METHOD	DEPTH

REMARKS
Field Instrument=

If refusal is encountered, describe all efforts used to confirm.

Field Decon: Yes / No / Dedicated Device

PROPORTIONS USED:

trace	0 to 10%	some	20 to 35%
little	10 to 20%	and	35 to 50%

EXAMPLE DESCRIPTION:
SAND, f-c; some f-c gravel; little silt; trace clay. Moist. Loose. 10R5/4.

Reviewed by Staff:

BACKFILL

Native Material _____ To _____ See Monitoring Well
Bentonite Grout/Chips _____ To _____ Completion Report
Concrete/Asphalt _____ To _____

Other _____ _____ **To**
_____

INTRODUCTION

Samples collected during field investigations and other activities are always subject to potential review by regulatory agencies and/or subpoena for litigation purposes. In order to document that control of the samples has been maintained at all times, it is necessary to utilize chain-of-custody forms to document where the sample is at all times from collection in the field to analysis in the laboratory.

CHAIN-OF-CUSTODY RECORDS

Chains-of-custody (COC) forms consist of four copies. One copy is kept by each person who has had custody. At a minimum, COCs will include the following information:

- Chain-of-custody identification number
- Project/client name
- Project location
- Project number
- Laboratory conducting analysis
- Name/location of party to receive laboratory report
- Name/location of party to receive laboratory invoice
- Sample number
- Sample type
- Number and type of sample containers
- Type of preservatives
- Signature and affiliation of sampler
- Date and time of collection
- Signatures of people involved in chain of possession
- Dates and times of sample transfer

A sample of a completed COC is attached.

With each transfer of the samples from one person to another or to a sample refrigerator, the transfer must be documented. All samples listed on the COC must be verified as being present by both the person relinquishing the samples and the one receiving them. This verification is documented by checking the appropriate transfer box for each sample on the right side of the COC.

1. When the sampler relinquishes the samples to someone else or to the sample refrigerator, the first transfer box is checked and the sampler signs the bottom of the COC as "relinquisher".

2. The person receiving the samples verifies that all samples are present and signs the bottom of the COC to accept the samples and documents the date and time. If the samples are relinquished to the Sample Refrigerator in one of the Fuss & O'Neill offices, the

"relinquisher" documents the receiver as "F&O Fridge".

3. The "relinquisher" keeps the last copy of the COC.

4. With each subsequent transfer of the samples, the last person to accept custody of the samples completes the transfer by checking the next transfer box for each sample and signing the COC.

5. The person receiving the samples verifies that the transfer boxes have been checked and signs the COC to acknowledge receipt.

6. The "relinquisher" keeps the last copy of the COC and forwards it to the project manager or his/her designee. When samples are relinquished from the F&O Fridge, they must be removed by F&O personnel. A copy of the COC is to be left in the filing basket in the field operations laboratory.

7. If subsequent transfers of the samples are made, steps 4 through 6 are repeated as necessary.

Each Fuss & O'Neill COC allows for samples to be transferred up to four times. If more than four transfers are necessary, additional COCs will be completed until the samples arrive at the laboratory. The original record will be returned to Fuss & O'Neill with the sample analysis report.

INTRODUCTION

All samples collected by Fuss & O'Neill during investigations and other activities are subject to potential review by regulatory agencies and/or subpoena for litigation purposes. The field data sheets and chains-of-custody are used to document sample collection and transfers between collection and arrival at the laboratory. In order to maintain a comprehensive record of samples collected, log books are kept in the Field Operations area in each office.

SAMPLE LOGBOOKS

There are two sample logbooks in every F&O office: a refrigerator logbook and a "master" sample logbook. Every sample collected by F&O employees will be recorded in the "master" logbook in each F&O office. The logbook will contain:

- job name
- job number
- date collected
- sample id
- sample location
- initials of sampler
- where the samples were relinquished on what date

The refrigerator logbook will only be filled out if the samples are relinquished to the F&O refrigerator in each respective office. The refrigerator logbook will contain:

- job name
- job number
- date collected
- chain of custody id
- initials of sampler
- dates of relinquishing

See section 030100 for relinquishing procedures.

INTRODUCTION

Sample handling procedures are important for preserving the quality of data collected in the field.

SAMPLE HANDLING

Field samples are to be collected in lab-supplied containers. The type of container used will depend upon the analysis to be conducted. Samples will be preserved in the field with ice packs or ice and lab-supplied chemicals according to the instructions of the laboratory. The pH of the samples will be verified in the field after preservation by pouring a small amount of the sample onto a piece of pH paper.

Liquid samples collected for volatile organic analyses will be preserved with HCl to a pH of <2. Any acid used for preservation will be added to the VOA vial before the sample is collected to ensure that adequate mixing occurs. The vial will not be reopened once it has been properly sealed.

Once any necessary pH adjustments have been made, the sample container will be placed in a cooler to reduce the temperature to approximately 4 degrees Celsius. **The outside of the sample container will be rinsed with tap water before it is placed into the cooler.**

A chain-of-custody form, establishing the party responsible for the samples, will be filled out in the field after sample collection. This form will document the entire history of sample custody and all transfers of sample possession. A description of a chain-of-custody form is provided in the section entitled "Documentation of Field Activities." Once the sample information has been entered, field personnel will sign the form in the lower left-hand corner, noting also their affiliation with Fuss & O'Neill, the date and the time. The samples will then remain in the custody of the sample collector until that person relinquishes them to another party as discussed in Standard Operating Procedure No. 030100.

RELINQUISHING SAMPLES DIRECTLY TO THE LABORATORY

Under most circumstances, samples are transported from the site directly to the laboratory. Upon arriving at the laboratory, the sample collector will sign the chain-of- custody, thereby relinquishing the samples to the laboratory. The laboratory technician accepting the samples will make sure that all of the sample containers are present by checking transfer box next to each sample. The technician will then sign the chain-of-custody as well as record the date and time of sample transfer to acknowledge the transaction. The last sheet of the chain-of-custody will be retained by the sample collector, to be returned to Fuss & O'Neill.

RELINQUISHING SAMPLES TO THE REFRIGERATOR

Samples will be transferred to the refrigerator when they cannot be taken to the laboratory directly, or when the laboratory has agreed to pick them up at Fuss & O'Neill. Upon arriving at Fuss & O'Neill, the sample collector will unlock the refrigerator. As samples are transferred from the coolers to the refrigerator, the sample collector will check the box next to each sample to be sure that all samples are present. The sample collector will then sign the chain-of-custody, writing "F&O refrigerator" as the receiving party. The date and time at which the samples were placed into the refrigerator will also be recorded. The chain-of-custody will remain in the refrigerator with the samples. The serial number of each chain-of-custody form will be recorded in the refrigerator log book along with the sample collector's initials, the date and the time. The refrigerator will then be locked.

The samples must be relinquished from the refrigerator to the F&O employee who will transfer them to the laboratory. As samples are removed from the refrigerator, they will be checked against the chain-of-custodies to be certain that all are properly accounted for. The F&O employee will then write "F&O refrigerator" as the relinquishing party and sign to accept the samples. In addition, that person will write the date and the time of the transfer on the chain-of-custody as well as in the sample log book. Transfer of the samples from the F&O employee to the laboratory will then follow the procedure outlined in "Transferring the Samples Directly to the Laboratory," above.

INTRODUCTION

Soil samples will be described in the field following ASTM D2488-69 methods. The soil color will be determined by consulting a Munsell Color Chart, while the description of grain size will be based on a particle size chart. This descriptive information, along with a thorough explanation of the sample location and sampling conditions, will be recorded on a field data sheet. Examples of soil sampling field data sheets and boring log are provided at the end of this document.

SAMPLING EQUIPMENT FOR SOIL SAMPLING

The following list includes the equipment which may be necessary to the sampling of soils:

1. Documentation

- General paperwork (maps, sampling and H&S plans, etc.)
- Logbook
- Pen and permanent marker
- Soil sampling field data sheets
- Sample labels
- Chain-of-custody forms

2. Personal Equipment

- Equipment required by Site Safety Plan
- Munsell Color Chart
- Grain size chart
- Disposable or rubber gloves
- 6' Ruler or small tape measure
- Water level measurement device
- Hand sprayers
- Paper towels
- Plastic garbage bags
- Bucket
- Wooden stakes

3. Sampling Equipment

- Excavation tools (shovels, post-hole diggers, pick, pry-bar and other tools)
- Approved sampling device (stainless steel hand auger, trier, aluminum coring tube, syringe sampler, etc.)
- Stainless steel mixing bowl
- Wooden tongue depressors or stainless steel spoon
- Zip-lock poly bags
- Organic vapor detector
- Coolers with ice packs or ice

4. Decontamination Equipment

- Non-phosphate detergent
- Nitric acid solution
- Methanol solution
- Deionized water
- Tap water

5. Site-Specific Equipment

- Keys to site facilities (when applicable)
- Sample containers for lab parameters

6. SS Soil Auger - Available Parts List

Qty	Description
3	Soil Auger Tool Kits
in each:	- 1-¼" or 2-½" auger w/bail
	- ⅞" open end combination wrench
	- 15/16" open end combination wrench
	- strap wrench
	- 3-¼" or 2-½" auger brush
	- sampling tube extraction tool
	- container of vegetable lubricant
3	Extension handles
4	6' extensions
1	3' extension

SURFACE SOIL SAMPLING

Surface soil sampling will be conducted with a stainless steel hand auger, trier, aluminum coring tube, syringe sampler, scoop, or another approved sampling device. The hand auger and scoops can be used when undisturbed samples are not required. See SOP 080100 for scoop sampling techniques. See SOP 080200 for hand auger sampling techniques.

Both the trier and the coring tube are used to collect undisturbed soil samples.

Samples will be transferred from the sampling device to glass jars with Teflon-lined lids by means of dedicated wooden tongue depressors or decontaminated stainless steel spoons. Those samples to be analyzed for volatile and semi-volatile compounds will be collected in 40 ml VOA vials with Teflon septa. Ice or ice packs will be used to preserve lab samples at 4 degrees Celsius immediately after collection. Soils to be screened for organic compounds in the field

will be separated from the rest of the sample prior to the screening procedure so that the portion submitted to the lab will remain intact. Methods of soil screening are discussed in a later section of the text.

Equipment which comes into contact with the sample will be thoroughly decontaminated or replaced between soil samples as outlined in SOP 040000.

SUB-SURFACE SOIL SAMPLING

A hand auger, soil core device, hand Geoprobe®, or direct push drill rig can be used to collect sub-surface soil samples (see SOP 080200). During monitoring well and test boring operations, sub-surface soil samples will be collected with a 24-inch split-tube sampler (hollow-stem auger rig) described in SOP 080300, or a 2-4 foot Geoprobe® sampler (direct-push rig) described in SOP 111000.

Sampling equipment will be cleaned between samples as outlined in SOP 040000. When necessary, drilling equipment will be steam-cleaned prior to the start of each boring.

METHODS OF SOIL SCREENING

The following are methods by which screening for volatile organic compounds in soil samples may be carried out: the split-tube method, headspace screening, the bag method, and through on-site gas chromatography. A detailed description of the collection of soil vapor for on-site gas chromatography is discussed in "Soil Gas Testing" later in the text.

Split-Tube Method

Volatile organic compounds may be detected by running the probe of a photoionization detector (PID) along the length of a split sample while it is in the split tube. This technique involves gently opening and agitating the sample in one or two places with a wooden tongue depressor and inserting the probe of the PID into this space before a reading is taken. Care should be taken not to touch the probe tip to the soil.

Between readings, the portable screening instrument will be allowed to pump ambient air until the instrument reading reaches background levels.

Headspace Screening

When headspace screening is conducted in conjunction with laboratory analysis, the sample for the laboratory will be collected first. The remaining soil will be placed in a jar, or more preferably, a resealable polyethylene bag. Any container utilized will be measured for organic vapors prior to use. The soil will be agitated within the sealed container to disaggregate the soil and liberate any volatile organic compounds into the headspace. The probe of the screening instrument will then be inserted into the headspace of the container and a reading will be obtained. Several readings of the vapors in the headspace will be measured in an attempt to duplicate the highest value. Between readings, the portable screening instrument will be

allowed to pump ambient air until the reading reaches background levels.

The Bag Method

A third technique of soil screening utilizing a portable PID or FID is the bag method (Robbins, 1989). Due to the destructive nature of this method, a portion of each soil sample will be separated out for laboratory analysis prior to soil screening by this method.

Apparatus

A resealable polyethylene bag will be fitted with a three way valve to allow access to the headspace of the bag while it is sealed from the ambient air. One port of the valve will access the bag itself, while a second will permit the bag to be inflated by a hand pump once it has been sealed. The third valve port will be connected to the probe of the PID or FID by means of a length of inert tubing. Movement of air in and out of the sealed bag may consequently be controlled by the position of the valve. Figure 080430 depicts the polyethylene bag sampling system.

Method Blanks

Prior to a screening event, the relative accuracy of the bag method system will be determined by conducting a series of blanks.

First, ambient air within an empty polyethylene bag will be screened to determine the impact of background conditions upon sample integrity. Background conditions in this situation would include both the ambient air and the materials out of which the apparatus is constructed. The polyethylene bag will be sealed and inflated by means of a hand pump. After four minutes of agitation, the three-way valve will be opened to allow any vapor present to flow into the probe of the instrument. The reading obtained will represent the background concentration of organic vapors for this particular sampling event. If this concentration is unusually high, the sample collector will determine the source of the contamination and eliminate it, if possible, prior to continuing soil screening.

A second blank will be conducted to determine whether the deionized water utilized to liquidate the sample affects sample integrity. The polyethylene bag containing deionized water will be sealed and agitated for four minutes. The three-way valve will subsequently be opened to allow the vapor in the headspace to flow into the probe of the instrument. The concentration of any organic vapor emanating from the deionized water will then be measured.

A soil standard blank will be prepared prior to each sampling event in order to construct a calibration curve for the contaminant of concern. This curve is necessary to properly relate the results of headspace screening to the actual concentration of the contaminant in the soil.

A soil sample will be collected from an unaffected area of the site. After sealing the uncontaminated soil and water mix and inflating the bag as described above, a measured amount of tetrachloroethylene, m-xylene or the contaminant of concern will be injected by

microliter syringe into the bag through a fitting with a Teflon septum.

The soil/water mix will be agitated for four minutes and an organic vapor concentration will subsequently be measured. This procedure will be repeated utilizing a series of concentrations within a calibration curve will then be constructed. Once this relationship is derived under experimental conditions, it can be used to calculate the concentrations of unknown volatile organics relative to the calibrated standards.

Gas Chromatography

Screening of soil samples may be conducted by an on-site gas chromatograph. Samples for this analysis will be collected in Teflon-lined glass jars, such as VOA vials.

DIRECT PUSH SOIL SAMPLING

In general, direct-push technology will be employed using a Geoprobe® Soil Sampler. Direct-push technology will be used when the soil conditions are favorable (e.g., sandy soils), when the volume of soil required for analysis is less than 8 ounces, and when the depth of sampling does not extend more than 16 feet below ground level (BGL). The following procedure will be used.

1. Assemble the Geoprobe® soil sampler lined with an acetate sleeve.

2. The assembled sampler will be placed in the driving position beneath the anvil and driven using a slow throttle speed to ensure straight penetration of the sampler for the first two or four feet. In order to install the sampler, the throttle control will be adjusted for the remainder of the stroke as necessary to compensate for geologic conditions.

3. Additional lengths of rod will be attached to the sampler and driven until the desired depth of sample collection is obtained.

4. The stop pin will be removed by inserting extension rods inside the probe rods enabling the piston to retract into the sample tube while the sample is taken.

5. The soil sampler will be advanced to the bottom of the sample interval. Care will be taken not to over-drive the sampler, to avoid compacting the soil sample in the sampler tube.

6. The pull cap will be attached to the top of the drill string and lifted to remove the soil sampler from the ground.

7. The acetate sleeve will be removed from the soil sampler and cut lengthwise with a razor knife to collect the soil sample. The sample will be transferred into the necessary containers using a dedicated wooden tongue depressor or similar method (i.e. dedicated gloves). Care will be taken to minimize disturbance of the soil during transfer.

8. Sample labels will be attached to the sample containers. The containers will then be placed into a cooler and maintained at 4□ C until they are delivered to the laboratory or the Fuss & O'Neill sample refrigerator. All information pertaining to the samples will be documented on field data sheets.

9. The geology of the sample will be recorded on a boring log.

10. The total VOC concentration of the excess soil will be measured inside a plastic zip closure bag using a photo-ionization detector (PID) or a flame-ionization detector (FID). This information will be recorded on the boring log.